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ANNUAL REPORTS

OF THE

DEPARTMENT OF THE INTERIOR

FOR THE

FISCAL YEAR ENDED JUNE 30, 1898.

NINETEENTH ANNUAL REPORT

OF THE

UNITED STATES GEOLOGICAL SURVEY,

CHARLES D. WALCOTT, DIRECTOR.

PART I.

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NINETEENTH ANNUAL REPORT

OF THE

UNITED STATES GEOLOGICAL SURVEY

PART I.—DIRECTOR'S REPORT, INCLUDING TRIANGULATION AND SPIRIT LEVELING

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., July 25, 1898.

SIR: I have the honor to transmit herewith a report of the operations of the United States Geological Survey for the year ending June 30, 1898.

In this connection permit me to thank you for the continued and active interest you have manifested in the work of the Survey.

I am, with respect, your obedient servant,

Chas. D. Walcott,

Director.

Hon. CORNELIUS N. BLISS,
Secretary of the Interior.

NINETEENTH ANNUAL REPORT OF THE UNITED STATES GEOLOGICAL SURVEY.

CHARLES D. WALCOTT, DIRECTOR.

INTRODUCTION.

During the fiscal year 1897–98 the organization of the Geological Survey as set forth in former reports was continued without material change (see page 27), and the field work of 1897 was chiefly a continuation of that of the previous season.

The record of field work will be found further on in this report, under headings covering accounts of the work of the various divisions of the Survey. At this place it seems desirable to make special reference to the completion of the field work of the subdivisional and topographic surveys of the Indian Territory, and to the general provisions under which the surveys of the forest reserves have been conducted.

INDIAN TERRITORY SURVEY.

The field surveys of the Indian Territory were completed the latter part of June. These included the resurvey of the lands of the Chickasaw Nation. During the progress of the work 63,881 miles of lines and 9,303 miles of spirit levels were run, 138 triangulation stations were located, and 30,885 square miles of topographic maps were made in addition to the subdivisional land maps.

The office work is now going forward rapidly in the branch office at Denison, Texas, and it is expected that before the close of the calendar year all of that work will have been completed.

It was anticipated that a balance of the appropriation for the survey of the lands of the Chickasaw Nation would be unexpended, and authority was granted by Congress to use any such unexpended balance for topographic surveys in the State of Texas, in order to complete the topographic sheets of the Indian Territory extending into Texas. The balance at the close of the fiscal year is not so great as was expected, owing to the long-continued and heavy rains, which prevented the rapid execution of field work during the months of May and June. There was sufficient balance, however, to provide for the survey of one or two topographic sheets adjoining the Chickasaw Nation on the south.

The surveys of the Indian Territory have advanced very satisfactorily, and credit therefor is due Mr. C. H. Fitch and the large corps of men who were engaged in the work. This work has demonstrated that it is more economical to survey large areas in this manner than under the contract system heretofore employed by the Government in its land-subdivision surveys. This statement applies to large areas, embracing 1,000 square miles or more. Small areas can be surveyed under the contract system, through the General Land Office or surveyors-general, at less cost than by the Geological Survey, as the contracts are let to local surveyors, who do not need to incur traveling expenses.

FOREST RESERVES.

In the sundry civil act approved June 4, 1897, provision was made for the survey of the forest reserves and the establishment of a forest policy on the part of the Government.

For a long time it was apparent to those who had given consideration to the subject that the destruction of the forests of this country, particularly in the Rocky Mountain region and on the Pacific Coast, was proceeding at a rate far more rapid than that of their restocking by growth, and that this destruction was wrought chiefly by fire, from which no benefit whatever accrues to the community, rather than by cutting, which, however wasteful it may be, is a necessity and results in good to the community. Movements in favor of the protection of the forests from fire and for the regulation of the cutting of timber therein were not successful owing to the lack

of a sufficiently strong local sentiment. Several years ago those interested in the protection of the forests determined to endeavor to have certain parts of the public domain segregated, reserved from settlement, and placed under the protection and regulation of the General Government. An act of Congress approved March 3, 1891, contains the following paragraph:

> That the President of the United States may, from time to time, set apart and reserve, in any State or Territory having public land bearing forests, any part of the public lands wholly or in part covered with timber or undergrowth, whether of commercial value or not, as public reservations, and the President shall, by public proclamation, declare the establishment of such reservations and the limits thereof. (Stat. L., vol. 26, p. 1103.)

Under this act seventeen forest reservations were established by Executive order prior to September 28, 1893, aggregating in area about 17,500,000 acres. Their names, locations, and areas are given in the following table:

Names, locations, and areas of forest reserves established prior to September 28, 1893.

Forest reserve.	Location.	Area.
		Acres.
Pacific	Washington	967,680
Cascade	Oregon	4,492,800
Bull Run	do	142,080
Ashland	do	18,560
Sierra	California	4,096,000
San Gabriel	do	555,520
San Bernardino	do	18,560
Trabuco Canyon	do	49,920
Yellowstone Park	Wyoming	1,239,040
South Platte	Colorado	683,520
Plum Creek	do	179,200
White River	do	1,198,080
Battlement Mesa	do	858,240
Pikes Peak	do	184,320
Grand Canyon	Arizona	1,851,520
Pecos River	New Mexico	311,040
Afognak	Alaska	Unknown.

The establishment of these reserves attracted little attention and created little or no opposition, since no real protection was afforded to areas reserved, and the cutting of timber and destruction by fires went on within their limits as elsewhere.

On February 22, 1897, in accordance with the recommendations of a committee of the National Academy of Sciences, thirteen additional reserves were established by Executive order, containing an aggregate area of 22,347,520 acres. Their names, locations, and areas, are given in the following table:

Names, locations, and areas of forest reserves established February 22, 1897.

Forest reserve.	Location.	Estimated area.
		Acres.
Black Hills	The central portion of the Black Hills, of South Dakota.	967,680
Bighorn	Slopes of the Bighorn Mountains in northern-central Wyoming.	1,127,680
Teton	Adjacent to and south of the Yellowstone Park Timber Reserve.	829,440
Flathead	Slopes of the Rocky Mountains, Montana, from the Great Northern Railroad to the international boundary.	1,382,400
Lewis and Clarke	Both slopes of the continental divide in Montana, from near the line of the Great Northern Railroad southward nearly to the forty-seventh degree of latitude.	2,926,080
Priest River	Priest Lake and Priest River basin in Idaho and Washington, from the Great Northern Railroad to the international boundary.	645,120
Bitterroot	The Bitterroot Mountains in Montana and Idaho.	4,147,200
Washington	The Cascade Range from south of the forty-eighth parallel to the international boundary, excepting the settled Skagit Valley.	3,594,240
Olympic	The Olympic Mountains	2,188,800
Mount Rainier	The former Pacific Forest Reserve and an extension southward nearly to the Columbia River along the Cascade Range.	2,234,880
Stanislaus	Sierra Nevada in California	691,200
San Jacinto	San Jacinto Mountains south of the San Bernardina Reserve.	737,280
Uinta	Uinta Mountains, exclusive of the Indian reservation.	875,520

In recommending the establishment of these forest reserves the committee of the National Academy of Sciences fully recognized the fact that the reserves established could not be maintained unless some plan were adopted under which the arable and mineral lands included within the limits of the reserves could be thrown open to settlement and provision be made for supplying from them the timber needed by settlers in the neighborhood. The committee believed that the great extension of the reserved areas as recommended by it would result in the adoption of regulations for the control of the reserves and in the judicious management of them, on the ground that the larger these areas the greater would be the number of people interested in drawing supplies from them or mining in them, and hence that the demand upon Congress for the enactment of laws securing their proper administration would be increased.

As was anticipated, the establishment of these reserves produced a strong protest from the residents of the States interested, resulting in the provision incorporated in the sundry civil act approved June 4, 1897, suspending until March 1, 1898, the Executive orders and proclamations of February 22, 1897, and providing for the examination and survey of the reserves by the Geological Survey during the intervening time, $150,000 being appropriated for this purpose. The object of this was to obtain for the use of the Department and the President the necessary information for revising the boundaries of the reserves, and subtracting from them such areas as were found to be more valuable for agriculture or mining than for the timber they contain.

As there is much confusion in the public mind in respect to this law, it seems desirable to insert it in this report, in order that the operations under it may be fully understood.

For the survey of the public lands that have been or may hereafter be designated as forest reserves by Executive proclamation, under section twenty-four of the Act of Congress approved March third, eighteen hundred and ninety-one, entitled "An Act to repeal timber-culture laws, and for other purposes," and including public lands adjacent thereto, which may be designated for survey by the Secretary of the Interior, one hundred and fifty thousand dollars, to be immediately available: *Provided*, That, to remove any doubt which may exist pertaining to the authority of the President thereunto, the President of the United States is hereby authorized and empowered to revoke, modify, or suspend any and all such Executive orders and

proclamations, or any part thereof, from time to time as he shall deem best for the public interests: *Provided*, That the Executive orders and proclamations dated February twenty-second, eighteen hundred and ninety-seven, setting apart and reserving certain lands in the States of Wyoming, Utah, Montana, Washington, Idaho, and South Dakota as forest reservations, be, and they are hereby, suspended, and the lands embraced therein restored to the public domain the same as though said orders and proclamations had not been issued: *Provided further*, That lands embraced in such reservations not otherwise disposed of before March first, eighteen hundred and ninety-eight, shall again become subject to the operations of said orders and proclamations as now existing or hereafter modified by the President.

The surveys herein provided for shall be made, under the supervision of the Director of the Geological Survey, by such person or persons as may be employed by or under him for that purpose, and shall be executed under instructions issued by the Secretary of the Interior; and if subdivision surveys shall be found to be necessaey, they shall be executed under the rectangular system, as now provided by law. The plats and field notes prepared shall be approved and certified to by the Director of the Geological Survey, and two copies of the field notes shall be returned, one for the files in the United States surveyor general's office of the State in which the reserve is situated, the other in the General Land Office; and twenty photolithographic copies of the plats shall be returned, one copy for the files in the United States surveyor-general's office of the State in which the reserve is situated; the original plat and the other copies shall be filed in the General Land Office, and shall have the facsimile signature of the Director of the Survey attached.

Such surveys, field notes, and plats thus returned shall have the same legal force and effect as heretofore given the surveys, field notes, and plats returned through the surveyors-general; and such surveys, which include subdivision surveys under the rectangular system, shall be approved by the Commissioner of the General Land Office as in other cases, and properly certified copies thereof thall be filed in the respective land offices of the districts in which such lands are situated, as in other cases. All laws inconsistent with the provisions hereof are hereby declared inoperative as respects such survey: *Provided, however*, That a copy of every topographic map and other maps showing the distribution of the forests, together with such field notes as may be taken relating thereto, shall be certified thereto by the Director of the Survey and filed in the General Land Office.

All public lands heretofore designated and reserved by the President of the United States under the provisions of the Act approved March third, eighteen hundred and ninety-one, the orders for which shall be and remain in full force and effect, unsuspended and unrevoked, and all public lands that may hereafter be set aside and reserved as public forest reserves under said Act, shall be as far as practicable controlled and administered in accordance with the following provisions:

No public forest reservation shall be established, except to improve and protect the forest within the reservation, or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States; but it is not the purpose or intent of these provisions, or of the Act providing for such reservations, to authorize the inclusion therein of lands more valuable for the mineral therein, or for agricultural purposes, than for forest purposes.

The Secretary of the Interior shall make provisions for the protection against destruction by fire and depredations upon the public forests and forest reservations which may have been set aside or which may be hereafter set aside under the said Act of March third, eighteen hundred and ninety-one, and which may be continued; and he may make such rules and regulations and establish such service as will insure the objects of such reservations, namely, to regulate their occupancy and use and to preserve the forests thereon from destruction; and any violation of the provisions of this Act or such rules and regulations shall be punished as is provided for

in the Act of June fourth, eighteen hundred and eighty-eight, amending section fifty-three hundred and eighty-eight of the Revised Statutes of the United States.

For the purpose of preserving the living and growing timber and promoting the younger growth on forest reservations, the Secretary of the Interior, under such rules and regulations as he shall prescribe, may cause to be designated and appraised so much of the dead, matured, or large growth of trees found upon such forest reservations as may be compatible with the utilization of the forests thereon, and may sell the same for not less than the appraised value in such quantities to each purchaser as he shall prescribe, to be used in the State or Territory in which such timber reservation may be situated, respectively, but not for export therefrom. Before such sale shall take place, notice thereof shall be given by the Commissioner of the General Land Office, for not less than sixty days, by publication in a newspaper of general circulation, published in the county in which the timber is situated, if any is therein published, and if not, then in a newspaper of general circulation published nearest to the reservation, and also in a newspaper of general circulation published at the capital of the State or Territory where such reservation exists; payments for such timber to be made to the receiver of the local land office of the district wherein said timber may be sold, under such rules and regulations as the Secretary of the Interior may prescribe; and the moneys arising therefrom shall be accounted for by the receiver of such land office to the Commissioner of the General Land Office, in a separate account, and shall be covered into the Treasury. Such timber, before being sold, shall be marked and designated, and shall be cut and removed under the supervision of some person appointed for that purpose by the Secretary of the Interior, not interested in the purchase or removal of such timber nor in the employment of the purchaser thereof. Such supervisor shall make report in writing to the Commissioner of the General Land Office and to the receiver in the land office in which such reservation shall be located of his doings in the premises.

The Secretary of the Interior may permit, under regulations to be prescribed by him, the use of timber and stone found upon such reservations, free of charge, by bona fide settlers, miners, residents, and prospectors for minerals, for firewood, fencing, buildings, mining, prospecting, and other domestic purposes, as may be needed by such persons for such purposes; such timber to be used within the State or Territory, respectively, where such reservations may be located.

Nothing herein shall be construed as prohibiting the egress or ingress of actual settlers residing within the boundaries of such reservations, or from crossing the same to and from their property or homes; and such wagon roads and other improvements may be constructed thereon as may be necessary to reach their homes and to utilize their property under such rules and regulations as may be prescribed by the Secretary of the Interior. Nor shall anything herein prohibit any person from entering upon such forest reservations for all proper and lawful purposes, including that of prospecting, locating, and developing the mineral resources thereof: *Provided*, That such persons comply with the rules and regulations covering such forest reservations.

That in cases in which a tract covered by an unperfected bona fide claim or by a patent is included within the limits of a public forest reservation, the settler or owner thereof may, if he desires to do so, relinquish the tract to the Government, and may select in lieu thereof a tract of vacant land open to settlement not exceeding in area the tract covered by his claim or patent; and no charge shall be made in such cases for making the entry of record or issuing the patent to cover the tract selected: *Provided further*, That in cases of unperfected claims the requirements of the laws respecting settlement, residence, improvements, and so forth, are complied with on the new claims, credit being allowed for the time spent on the relinquished claims.

The settlers residing within the exterior boundaries of such forest reservations, or in the vicinity thereof, may maintain schools and churches within such reservation,

and for that purpose may occupy any part of the said forest reservation, not exceeding two acres for each schoolhouse and one acre for a church.

The jurisdiction, both civil and criminal, over persons within such reservations shall not be affected or changed by reason of the existence of such reservations, except so far as the punishment of offenses against the United States therein is concerned; the intent and meaning of this provision being that the State wherein any such reservation is situated shall not, by reason of the establishment thereof, lose its jurisdiction, nor the inhabitants thereof their rights and privileges as citizens, or be absolved from their duties as citizens of the State.

All waters on such reservations may be used for domestic, mining, milling, or irrigation purposes, under the laws of the State wherein such forest reservations are situated, or under the laws of the United States and the rules and regulations established thereunder.

Upon the recommendation of the Secretary of the Interior, with the approval of the President, after sixty days' notice thereof, published in two papers of general circulation in the State or Territory wherein any forest reservation is situated, and near the said reservation, any public lands embraced within the limits of any forest reservation which, after due examination by personal inspection of a competent person appointed for that purpose by the Secretary of the Interior, shall be found better adapted for mining or for agricultural purposes than for forest usage, may be restored to the public domain. And any mineral lands in any forest reservation which have been or which may be shown to be such, and subject to entry under the existing mining laws of the United States and the rules and regulations applying thereto, shall continue to be subject to such location and entry, notwithstanding any provisions herein contained.

The President is hereby authorized at any time to modify any Executive order that has been or may hereafter be made establishing any forest reserve, and by such modification may reduce the area or change the boundary lines of such reserve, or may vacate altogether any order creating such reserve. (Sundry civil act approved June 4, 1897.)

The suspension of the forest reserves in the States of Wyoming, Montana, Utah, Washington, Idaho, and South Dakota until March 1, 1898, was terminated on that date, and no further suspension was made; all the suspended reserves are now subject to the laws governing forest reserves.

Upon the enactment of this legislation—June 4, 1897—arrangements were at once made for the topographic and subdivisional surveys of those portions of the suspended reserves in which there are large interests that may be injuriously affected if the areas are included within the reserves; for instance, the agricultural and mining interests of portions of the Black Hills Reserve of South Dakota, the mining interests of the southwestern portion of the Washington Reserve of Washington, and the timber interests of the eastern portion of the Bitterroot Reserve in Montana. The purposes of the topographic surveys are (*a*) the preparation of topographic maps, on a scale of 2 miles to the inch, with contour intervals of

100 feet, as base maps for the representation of forestry details, agricultural and mineral lands, and future geologic surveys; (*b*) the establishment of bench marks indicating elevation above sea level, for vertical control in topographic mapping, and for all mining, engineering, and geologic work; (*c*) the subdivision of reserves, where necessary, by running township lines for the purpose of designating tracts of land; (*d*) the demarcation, by means of section lines, of tracts which are more valuable as agricultural and mineral lands than for timber; and (*e*) the mapping by the topographer in charge of each party of the outlines of all wooded and forest areas.

Early in July the forestry survey was organized, and soon thereafter special forestry experts began the study of the distribution of the forests and woodlands, the size and density of the timber, the distribution of the leading economic species, the effect of the ravages of forest fires and the amount of damage inflicted by them, the amount of dead timber, the extent to which the forests are pastured, and the extent of the timber already cut and the effects of the deforesting; also the relation of the timber supply to transportation, the local demands of miners and settlers, and the supply needed for more distant markets.

The examinations of the surveyors and forestry experts are not limited to the present lines of the forest reserves, but, as provided for in the statute authorizing the survey, they include public lands adjacent to the reserves.

It is anticipated that the 60,000 square miles of forests now included within the reserves can be thoroughly and economically surveyed within five years, provided adequate appropriations are made for the purpose. Nearly enough, if not sufficient, data for the construction of topographic and forestry maps have been secured during the past field season to permit of an intelligent rectification of the boundaries of most of the reserves containing areas where apparent injury or injustice is being inflicted by the establishment of the reserves.

The progress of the surveys of the forest reserves is set forth in more detail on later pages of this report (see pages 93, 108).

ALASKA.

When it was decided to continue the explorations in Alaska a call was made for volunteers among the geologists and topographers, as the work promised to be of unusual severity and to involve many hardships. The parties were quickly made up and left early in May to begin the exploration of the almost unknown area between the coast line on the south and the Yukon on the north. One main route was up the Sushitna, two parties to separate at suitable localities, one to explore the valley of the Kuskokwim, the other to go to the headwaters of the Sushitna and pass over into the valley of the Tanana. Another main route was by way of the Chilkoot Pass to the region of the Klondike, White, and Tanana rivers. The route of the two military expeditions to which geologists were attached was in the line of the Copper River drainage basin northward to the Tanana and Yukon rivers, where they were to come into the field of the topographic survey being conducted by one of the parties on the Yukon near the British boundary. The organization of the parties is given later, under the heading "Surveys in Alaska" (pp. 116–117).

COMMITTEES.

The committees appointed in the previous fiscal year for the purpose of assisting the Director by making investigations and recommendations concerning special matters referred to them have been modified and continued and several new committees have been appointed.

(1) The Committee on Petrographic Reference Collection consists of Messrs. Cross (chairman), Diller, and Lindgren. The collection now numbers 949 rock specimens, about 400 having been added during the year. Descriptive cards and several card indexes have been prepared and typewritten, and the interesting material of the collection is accordingly now available for reference by petrographers of the Survey. An accession catalogue has been completed to date, and labels specially designed for the collection have been written. The work of caring for and studying this collection has fallen

chiefly upon Mr. Cross, who has been assisted during several months by Mr. Ransome and for shorter periods by Messrs. Smith and Spencer. This committee has charge of the petrographic microscopes of the Survey, and assigns them to geologists as needed.

(2) The Committee on Petrographic Laboratory consists of Messrs. Diller (chairman), Turner, and Willis. All material of which thin rock sections are requested by geologists of the Survey is referred to this committee, which makes recommendations in relation to the desirability of having sections cut and the order of precedence in which the material should be taken up for sectioning. The statement of the work performed in the Petrographic Laboratory is given later in connection with the report of Mr. Diller's work (p. 51).

(3) The Committee on Analyses of Rocks consists of Messrs. Cross (chairman), Diller, and Lindgren. Professor Clarke, chief chemist, and Mr. Willis are associate members. This committee is charged with the duty of considering all requests for analyses of rocks, with a view to recommendation as to the merits of each request. Early in the year a circular was issued by the Director, upon recommendation of this committee, calling the attention of geologists to the duplication of chemical analyses of rocks and the need of intelligent discrimination as to the value of numerous analyses requested. The circular states that the committee requires information concerning material submitted for analysis, and the data needed for an intelligent estimate are indicated, with the request that they be hereafter submitted. As a result of the work of this committee, the labors of the Chemical Laboratory have been lightened, and the attention of geologists has been called to published material.

(4) A Committee on Analyses of Ores was organized, consisting of Messrs. Lindgren (chairman), Hayes, and Weed, with Messrs. Clarke and Willis as associate members. No work requiring reference to this committee has been submitted during the fiscal year.

(5) A committee was appointed to consider the Nomenclature of Igneous Rocks as used in the folios of the Geologic

Atlas only. It consisted of Messrs. Van Hise (chairman), Cross, Diller, Turner, and Weed. Several sessions of the committee were held during the year, and the following report, signed by all the members of the committee, was submitted to the Director and approved by him:

CIRCULAR UPON THE NOMENCLATURE OF THE IGNEOUS ROCKS, FOR INFORMATION AND GUIDANCE OF GEOLOGISTS OF THE SURVEY.

In the preparation of the geologic folios of the Geological Survey it has become desirable that greater uniformity in the use of petographic terms and names, especially for igneous rocks, should obtain. A committee composed of members of the Survey was some time ago appointed to examine into the matter and make recommendation. This committee has studied the difficulties which have thus far arisen and, taking into account the present status of systematic petrography, has formulated certain rules affecting petrographic terminology and made certain suggestions for the use of rock names in the geologic folios. The following rules and suggestions are hereby approved and submitted for the guidance of the geologists of the Survey.

TERMINOLOGY.

Compound names.—Compounds of rock names shall be applied only to intermediate forms. Thus, gabbro-diorite is a rock intermediate between gabbro and diorite. It is not a gabbro in which the pyroxene has been changed to amphibole. Such a rock is a metagabbro. Granite-syenite is another example.

Metamorphic rocks.—The prefixes *meta* and *apo*, if used at all, shall be used in the following definite senses:

Meta is to be prefixed to the name of the original rock. Thus, metadiabase will indicate an altered diabase without specifying the kind of alteration. *Apo* is to be used, as proposed by Dr. Bascom, for devitrification products, as a prefix to the name of the original rock.

Porphyry.—Porphyry and its derivatives are to be used as purely textural terms, without limitation to mineralogical groups. Porphyry will thus apply to all rocks, whatever their composition, containing phenocrysts in a distinct groundmass, and without regard to the size of the grains of the groundmass. Porphyrite is discarded as superfluous; also quartz-porphyry, orthoclase-porphyry, etc., as implying special mineral composition not expressed in these names.

Granophyre, felsophyre, and *vitrophyre* may be applied to any porphyries possessing, respectively, granular, felsitic, or vitreous groundmasses. The Rosenbusch use of *granophyre* is thus rejected.

Glass.—The collective term for vitreous rocks shall be glass.

NOMENCLATURE.

Age.—Age is not recognized as a factor in the naming of igneous rocks. Such names as quartz-porphyry, porphyrite, melaphyre, etc., recognizing age as a factor, are to be dropped.

Geological occurrence.—Geological occurrence is not recognized as a factor in the naming of igneous rocks.

Rock names for folio legends.—The names of igneous rocks used in the legends of folios and in the general portions of the accompanying text should be the simplest and best-known terms applicable under the circumstances. The importance of a rock within a quadrangle must be considered in determining its name for folio use. In the present condition of systematic petrography it is deemed inexpedient to for-

mulate definitions of rock groups. The following recommendations will, it is hoped, result in the plainest and simplest nomenclature possible at the present time:

(*a*) If a rock belongs to a variety under a commonly known group the name of that group should be used in the legend, but the more specific character and name should be given in describing the rock in the text. Granite, syenite, nepheline-syenite, monzonite, diorite, gabbro, peridotite, rhyolite, trachyte, phonolite, andesite, and basalt are examples of group terms of this class.

(*b*) If two or more varieties of one group occur within a quadrangle, the use of local names, as explained in a later section, is recommended.

(*c*) Where a rock of unusual character and rare occurrence, for which a special name has been proposed, is found to be of much importance in a quadrangle, that name may be used throughout the folio, e. g., theralite in the Livingston quadrangle (folio 1).

(*d*) If several rare forms occur, but are not geologically important, they may be grouped in the legend under some general term, e. g., "basic dikes."

(*e*) Since a large share of the use of each rock name contained in a folio is with reference to the rock mass as a geological body rather than to its exact petrographic character, the use of local names for varieties under one general group is deemed advantageous. The use of these names may be illustrated by the following:

Granite is a group name for several rock varieties which have received special names, as granitite, granite proper, hornblende-granite, aplite, granulite (fr.). If one area contains granitite and aplite, each in important masses, to be distinguished upon the map, the one may be called "Butte granite," the other "Bluebird granite," in the legend.

By this procedure the existing rock varieties of importance may be discriminated, the local geologist or layman supplied with a name comparatively free from technical meaning, and the existence of the local terms will gradually educate those who use them to the distinguishing characteristics noticed by the petrographer.

(*f*) Geologists working in adjacent districts are directed to agree upon a legend designation for each rock occurring in both areas.

(6) A Committee on Map Editing and Printing was appointed April 16, 1898. It consists of Messrs. Kübel (chairman), Baker, and Stose. It is the duty of this committee to consider questions relating to the editing, engraving, and printing of topographic maps and of folios of the geologic and topographic atlases. The committee determines the order of precedence to be given to atlas sheets and folios submitted for publication, and makes recommendations to the Director upon moot questions affecting the style of the maps and with reference to any modification of current procedure which may be proposed.

NEEDS AND ACKNOWLEDGMENTS.

It is desirable that there should be a considerable increase in the appropriations for geology and topography. The Survey has developed rapidly, but the appropriations for these two most essential features are less than they were prior to the reduction in 1893. At least $40,000 should be added to geol-

ogy and $45,000 to topography in order to enable the Bureau to meet the public demands for surveys that come from all portions of the country.

In accordance with the recommendation made for the increase of room for the Survey, authority was granted by Congress to secure two additional floors in the Annex Building, to which some of the laboratories are now being transferred.

Various Government bureaus have cordially cooperated with the Survey in the endeavor to advance and perfect its work. These include the Smithsonian Institution, the National Museum, the Coast and Geodetic Survey, the General Land Office, and the Government Printing Office. Special acknowledgment is made to the Coast and Geodetic Survey, the General Land Office, and the Government Printing Office for the promptness and courtesy with which they have responded to numerous requests that have been made of them from time to time during the year.

The members of the Survey have worked harmoniously and faithfully, cooperating with one another and with the Director in carrying forward the work intrusted to the Survey. Special mention is made of the faithful service of the chief clerk and the chief disbursing clerk, who took charge of the administrative and business affairs of the Survey during the Director's long absence in the West in the field season of 1897.

PLAN OF OPERATIONS.

The general plan of operations for the fiscal year 1897–98 was laid before the honorable Secretary of the Interior on June 10, 1897, and was approved by him June 15, 1897. The detailed plan as approved by the Secretary is on file in the Department.

The greater portion of the work hereinafter reviewed was executed in conformity with the plans submitted. A general statement of appropriations and of allotments for work in geology, paleontology, and topography immediately follows, and where each field party was employed and what each party and office division accomplished will be found set forth on later pages under the heading "Work of the year" (p. 31).

APPROPRIATIONS.

For the fiscal year 1897–98 there was appropriated for the work of the United States Geological Survey the sum of $1,033,983.60. Separate amounts were, by the terms of the acts, set apart for specific branches of work and for the salaries of persons connected with these branches. For convenience of reference these separate appropriations are here brought together and classified.

The legislative, executive, and judicial act contained the following items:

For salaries of Director, chief clerk, chief disbursing clerk, librarian and photographer, together with clerks, messengers, watchmen, et al.		$31,390.00
For rent		11,200.00
Total		42,590.00

The sundry civil act included the following items:

For pay of skilled laborers, etc		13,000.00
For topographic surveys	$175,000.00	
For pay of two geographers and two topographers	9,200.00	
Total for topographic work		184,200.00
For geologic surveys	100,000.00	
For general investigations in Alaska	5,000.00	
For pay of four geologists	13,700.00	
Total for geologic work		118,700.00
For paleontologic researches	10,000.00	
For pay of two paleontologists	4,000.00	
Total for paleontologic work		14,000.00
For chemical and physical researches	7,000.00	
For pay of one chemist	3,000,00	
Total for chemical work		10,000.00
For gaging streams and determining water supply		50,000.00
For preparation of illustrations		13,000.00
For preparation of report on mineral resources		20,000.00
For purchase of books and distribution of documents		2,000.00
For engraving and printing maps		60,000.00
For rent		4,200.00

There was appropriated in the same act for engraving, printing, and binding publications of the Geological Survey, $37,000; this sum to be disbursed, not by the Geological Survey, but by the Public Printer. The items are as follows:

For engraving illustrations for the report of the Director.	$7,000.00	
For engraving illustrations for monographs and bulletins.	10,000.00	
For printing and binding monographs and bulletins	20,000.00	
Total for engraving, etc		37,000.00

Furthermore, the same act contained the following special appropriations:

Special appropriation for the survey of forest reserves	$150,000.00
Special appropriation for the survey of a portion of the boundary line between Idaho and Montana	7,650.00
Total	726,340.00

The Indian Department act contained the following items:

Special appropriation for the completion of the survey of lands in the Indian Territory	$100,000.00	
For the resurvey of lands of the Chickasaw Nation	141,500.00	
Total for Indian Territory survey		241,500.00
Total		967,840.00

The deficiency bill approved July 19, 1897, contained the following items:

Transmission of public documents through the Smithsonian Institution	$2,230.60	
Mineral resources: Printing advance copies of papers	1,000.00	
Surveying lands in Indian Territory	8,000.00	
To pay amounts found due by the accounting officers of the Treasury to Chicago, Rock Island and Pacific Railway Company for the transportation of assistants	93.75	
		11,324.35

A joint resolution (Public resolution No. 3) approved January 20, 1898, made the following appropriation:

For preparing a map of Alaska	2,500.00

The urgent deficiency bill approved January 28, 1898, contained the following items:

For completion by the Geological Survey of the survey of the lands in the Indian Territory	30,000.00
For the geological and topographical surveys in Alaska, to continue available until June 30, 1899	20,000.00
Transmission of public documents through the Smithsonian Institution	2,319.25
Aggregate appropriations for the Geological Survey for the fiscal year 1897–98	1,033,983.60

ORGANIZATION.

For convenience of administration, the following scheme of organization of the work and business of the Survey was adopted some years ago. Under this the work is primarily divided into four branches, within each of which there are a number of divisions.

Organization of the Geological Survey.

Branch.	Division.
Geologic	Geology.
	Paleontology.
	Chemistry.
	Hydrography.
	Mineral Resources.
Topographic	Triangulation.
	Topography.
	Geography and Forestry.
Publication	Illustrations.
	Editorial.
	Engraving and Printing.
Administrative	Documents, Correspondence, and Records.
	The Library.
	Disbursements and Accounts.

ALLOTMENTS.

ALLOTMENTS TO GEOLOGIC WORK.

As stated above, the total appropriation for geologic work for 1897–98, including the special appropriation for work in Alaska, was $118,700. The following table exhibits the allotments that were made to the heads of the several geologic parties:

Allotments to geologic parties.

Party.	Allotment.
1. Executive office	$11,520
2. N. S. Shaler (Massachusetts and Virginia)	2,000
3. B. K. Emerson (Massachusetts, Connecticut, and Rhode Island)	750
4. T. N. Dale (New York and Vermont)	2,000
5. J. F. Kemp (New York)	400
6. J. E. Wolff (New Jersey and Vermont)	600
7. C. D. White (Pennsylvania, West Virginia, Virginia, Kentucky, and Tennessee)	2,400
8. M. R. Campbell (West Virginia and Kentucky)	4,650
9. C. W. Hayes (Georgia, Alabama, and Tennessee)	2,500
10. Arthur Keith (Virginia, Tennessee, North Carolina, and Maryland)	2,515
11. W. B. Clark (eastern Maryland, New Jersey, and North Carolina)	1,000

Allotments to geologic parties—Continued.

Party.	Allotment.
12. G. H. Eldridge (Florida)	$2,750
13. C. R. Van Hise (Lake Superior and Appalachian Mountain region)	8,000
14. T. C. Chamberlin (Illinois and central interior region)	2,000
15. G. K. Gilbert (Great Lakes and New York)	4,500
16. R. T. Hill (Texas)	3,300
17. J. A. Taff (Indian Territory)	2,600
18. T. W. Vaughan (Texas)	975
19. W. H. Weed (Montana)	4,100
20. S. F. Emmons (Utah)	7,000
21. R. C. Hills (Colorado)	1,000
22. C. W. Cross (Colorado)	5,450
23. Arnold Hague (Yellowstone National Park)	7,900
24. J. S. Diller (Oregon, California, and Petrographic Laboratory)	5,200
25. H. W. Turner (California)	3,900
26. G. F. Becker (California)	6,250
27. Waldemar Lindgren (Idaho)	5,400
28. Bailey Willis (Washington and map editing)	8,840
29. Alaska	5,000
30. Contingent fund	4,200
Total	118,700

ALLOTMENTS TO PALEONTOLOGIC WORK.

The total appropriation for paleontologic work for 1897–98 was $14,000, which was allotted to the several sections of the work as follows:

Allotments to paleontologic work.

Section.	Allotment.
Paleozoic work	$2,500
Mesozoic work	2,050
Cenozoic work	2,600
Paleobotanic work	4,250
Vertebrate paleontology	1,000
General assistant's salary	1,200
Contingencies	400
Total	14,000

ALLOTMENTS TO TOPOGRAPHIC WORK.

The appropriation for topographic work for 1897–98 was $184,200, which was allotted to the several sections of the work as follows:

Allotments to topographic work.

Section.	Allotment.
Administration	$12,000
Atlantic section	55,400
Central section	40,800
Rocky Mountain section	31,900
Pacific section	35,500
Instruments, repairs, and drawing material	5,000
Contingencies	3,600
Total, including stated salaries	184,200

ALLOTMENTS TO FORESTRY WORK.

The appropriation for the surveys and investigations of the forest reserves was $150,000, which was allotted as follows:

Allotments to forestry work.

Party.	Allotment.
E. M. Douglas	$59,000
R. U. Goode	69,000
Henry Gannett	14,000
Office pay roll and contingencies	8,000
Total	150,000

MISCELLANEOUS ALLOTMENTS.

CHEMISTRY.

For pay of all persons connected with the chemical work, and for the purchase of chemical supplies, apparatus, etc., the entire appropriation of $10,000 was allotted.

HYDROGRAPHY.

The appropriation of $50,000 for hydrography was allotted as follows: $25,000, to the measurement of streams, including surveys of reservoir sites; $10,000 to the investigation of underground currents and artesian wells; and the remainder, $15,000, to the preparation of reports upon the methods of utilizing the water resources of the United States (see Part IV of this Annual Report, and the series of Water-Supply Papers).

The appropriation was apportioned by States, as follows:

Apportionment of appropriation for hydrography, by States.

State.	Allotment.
Alabama	$700
Arizona	2,120
California	3,000
Carolinas	2,200
Colorado	2,920
Georgia	1,600
Idaho	1,200
Indiana	380
Kansas	5,510
Maryland	1,100
Michigan	450
Montana	1,700
Nebraska	5,600
Nevada	1,300
New England	1,300
New Mexico	2,000
North Dakota	1,900
Oklahoma	200
Oregon	1,400
Pennsylvania and New York	1,500
South Dakota	1,800
Texas	2,020
Utah	1,900
Virginias	1,500
Washington	1,600
Wyoming	3,100
Total	50,000

MINERAL RESOURCES.

The entire appropriation for the preparation of the report on mineral resources, $20,000, was allotted to gathering and compiling the statistical data for the calendar year 1897, and for the preparation of a report upon the same, which is published as Part VI of this Annual Report.

ENGRAVING AND PRINTING MAPS, ETC.

The appropriations for engraving and printing maps, for the purchase of books and distribution of documents, for the preparation of illustrations, for pay of skilled laborers, etc., and the special appropriations, were allotted and expended for the specific purposes named in the act.

WORK OF THE YEAR.

As already indicated, the general organization of the Survey, by branches and divisions, remained the same as during the previous year.

The approved plan of operations was executed in all essential particulars, such slight departures therefrom as were made being due to conditions arising during the year which could not be anticipated. A detailed statement of the work follows:

GEOLOGIC BRANCH.

DIVISION OF GEOLOGY.

NEW ENGLAND REGION.

Shaler party (Massachusetts).—In Massachusetts Professor Shaler continued the study of the geology of Cape Cod, tracing out an extension of the Truro series. He was assisted throughout the year by Mr. J. B. Woodworth. For an account of investigations by himself and assistants in the Richmond coal field, see paragraph under "Atlantic Coastal Plain region," page 36.

Emerson party (Massachusetts).—Prof. B. K. Emerson continued his work in Massachusetts, aided by Mr. J. H. Perry. During Professor Emerson's absence, while attending the International Congress of Geologists at St. Petersburg,

Mr. Perry continued field work alone. The district studied lies east of the Connecticut River in Worcester County. Some additional observations were made in quadrangles already surveyed in Berkshire County. The distribution, sequence, and origin of the Paleozoic and pre-Paleozoic rocks of Massachusetts are the object of these investigations, as well as the distribution and character of useful material, such as building stone and road metal. Professor Emerson was also engaged in reading proof of his monograph on the Geology of Old Hampshire County, Massachusetts, comprising Franklin, Hampshire, and Hampden Counties (Monograph XXIX), and in preparing manuscript for the Holyoke and Housatonic folios of the Geologic Atlas.

Dale party (Vermont and New York).—Prof. T. Nelson Dale prosecuted a geologic survey in the Bennington quadrangle, Vermont, in cooperation with Prof. J. E. Wolff and assisted by Messrs. L. M. Prindle and R. H. Chute, jr., and temporarily by Mr. G. W. Stose. The purpose of the investigation was the determination of the stratigraphy and structure of the Silurian and Cambrian formations in the Green Mountains. Active field work was carried on from July 1 to September 17.

The surveys of the slate belt of eastern New York and western Vermont having been completed, office work was devoted to preparing manuscript and illustrations for the paper which appears in Part III of this Annual Report. A large collection of specimens from the slate belt was labeled and arranged for shipment to the National Museum, and field notes resulting from the work in the Bennington quadrangle were studied. It is believed that the economic results of the surveys of the slate belt will be valuable to the district described.

Wolff party (Vermont and New Jersey).—Prof. J. E. Wolff conducted surveys in the Bennington quadrangle, Vermont, in cooperation with Professor Dale, and continued studies of the Franklin, New Jersey, zinc district.

The rocks of the Bennington quadrangle comprise Paleozoic sediments and a core of older gneisses. In connection with work under Professor Pumpelly in western Massachusetts, Professor Wolff acquired special knowledge of the obscure

characteristics of the older rocks in this district, and he is thus peculiarly fitted to determine their relations. Professor Dale has had long experience in observing the complex structures of the Paleozoic strata, and is thus equally qualified to study that portion of the geology in this district.

To illustrate the report on the Franklin zinc district, a special topographic map of the mineralized area has been made. Through the courtesy of the New Jersey Zinc Company, maps of the mines are supplied Professor Wolff. The facts concerning this peculiar and interesting district are to be published in the Franklin folio of the Geologic Atlas.

Kemp party (New York).—Prof. J. F. Kemp, assisted by Mr. Charles Fulton, surveyed the Elizabethtown and Mount Marcy quadrangles, as well as parts of the Lake Placid and Ausable. The field season extended from July 1 to September 10. The Mount Marcy quadrangle and large areas of the other quadrangles consist of the igneous rock known as anorthosite. The associated rocks are metamorphosed sediments, which are involved in the great igneous mass, and variable gneisses.

Special attention has been paid by Professor Kemp to the occurrence of magnetic iron ores of igneous origin in the Adirondacks, and he has prepared a paper on that subject, with a general account of similar iron ores elsewhere, which appears in Part III of this Annual Report.

APPALACHIAN REGION.

White party (Pennsylvania, etc.).—Mr. C. David White continued his investigation of the flora of the Coal Measures, with special reference to the value of the fossil plants as an aid to stratigraphic correlation. In Pennsylvania additional collections were made from the Pottsville and Pocono formations. The flora of the latter was found to be surprisingly uniform and essentially identical with that of the same horizon in Virginia and of the Horton series of Nova Scotia.

In the McAlester coal field, Indian Territory, collections of fossil plants of Carboniferous age had been made by Mr. Taff. These were submitted to Mr. White, who has arranged and systematically studied them. A report stating, among other

things, the approximate correlation of the formations of the McAlester coal field with those of several other coal fields in this country appears in Part III of this Annual Report.

A systematic description of the fossil plants from the Pottsville (Lykens) series in the southern anthracite field, Pennsylvania, is in preparation.

Campbell party (Kentucky and West Virginia).—Mr. M. R. Campbell was assisted by Messrs. W. C. Mendenhall and L. C. Glenn. He extended detailed and precise surveys over 2,875 square miles of the Appalachian coal field in northeastern Kentucky and West Virginia. The quadrangles examined were the Beattyville, Salyersville, and Prestonburg in Kentucky, and the Huntington and Charleston in West Virginia. These correspond with the whole or parts of the following counties: Powell, Montgomery, Menifee, Morgan, McGoffin, Wolff, Breathitt, Johnson, and Floyd of Kentucky, and Wayne, Lincoln, Cabell, Putnam, and Kanawha of West Virginia. A small part of Lawrence County, Ohio, was also included.

The object of Mr. Campbell's surveys is to map the distribution of coal beds and their associated strata; to trace each bed continuously, so that variations of character may be determined and beds may be correctly identified; to ascertain the lay of coal beds and their depths below the surface; and to secure data which shall enable the reading of the history of the Coal Measures epochs.

In Johnson and Floyd counties, Kentucky, the surveys were directed with special reference to the occurrence of oil-bearing strata and their relations to the general features of the district.

During the fiscal year Mr. Campbell has submitted for publication maps, sections, and descriptions of the following quadrangles: Standing Stone, Tennessee; Raleigh, West Virginia; Bristol, Virginia–Tennessee. These will appear as folios of the Geologic Atlas.

Hayes party (Georgia and Alabama).—Mr. C. W. Hayes was engaged from July till December partly in the preparation of manuscript maps and descriptions of the Dalton, Cartersville, and Marietta quadrangles, all in Georgia, and the Tallapoosa quadrangle, in Georgia and Alabama. These were completed,

but are withheld from publication pending the conclusion of a very difficult question which affects the maps of a large area, namely, the age and relations of the Ocoee series. Mr. Hayes also, during this half year, worked on a monographic report of the results of his surveys in the southern Appalachians. He has been engaged in Tennessee, Georgia, and Alabama since 1888, and has completed the survey of sixteen quadrangles, covering about 15,700 square miles. For nine quadrangles the geologic facts have been published in folios of the Geologic Atlas. For the remaining quadrangles the manuscripts are either ready or in preparation. But it is desirable that all the facts should be assembled and discussed more fully than is possible in the folios. This will be accomplished in the monograph.

On December 17, in response to a request from the State Department, Mr. Hayes was detailed as geologist to accompany the Nicaraguan Canal Commission. He immediately reported for that duty, in which he was still engaged at the close of the fiscal year.

Keith party (Virginia, Maryland, North Carolina, and Tennessee).—Mr. Arthur Keith continued work, without field assistants, in North Carolina, Tennessee, and northern Georgia, and in Maryland and Virginia around Washington. In the southern area the immediate object was to complete a report on the Cranberry (North Carolina) district, and another on the geology of Cherokee County, North Carolina, which is to be published in cooperation with the North Carolina geological survey. Near Washington additional studies were made to decide questions relating to the Washington folio of the Geologic Atlas, about to be prepared for publication.

In the office Mr. Keith prepared for publication the maps and description of the Cranberry quadrangle, North Carolina, for the Geologic Atlas. The Wartburg, Tennessee, folio was published during the year. A more general report on the Cranberry district has been completed, but is held subject to extensions of work on the Pisgah and Mount Mitchell quadrangles. Brief reports were made on the Cambrian formations of Tennessee and Virginia, on eruptive rocks in the Paleozoic

formations of Virginia, and on the volcanic rocks of the Piedmont Plateau.

On economic lines the chief studies have been the associations and occurrence of mica in the Cranberry district and the location of ores of iron, gold, and silver-lead in North Carolina.

ATLANTIC COASTAL PLAIN REGION.

Clark party (Maryland, etc.).—Prof. William B. Clark, State geologist of Maryland, assisted by Messrs. G. B. Shattuck, R. M. Bagg, A. Bibbins, C. Abbe, L. C. Glenn, G. T. Surface, and C. M. Hall, of the State survey, has been engaged in special studies of the Potomac formation and the Upper Cretaceous and Eocene formations in Cecil, Harford, and Anne Arundel counties, Maryland.

The Potomac formation, hitherto mapped as a unit, is found to consist of four formations, named the Patuxent, Arundel, Patapsco, and Raritan. The discrimination of these members leads to the recognition of corresponding episodes in the Jurassic and early Cretaceous history of the Atlantic Coast. The results are an important contribution to a difficult problem.

Professor Clark's work is carried on under a plan of cooperation between the State survey and the United States Survey, in accordance with which the latter will receive for publication in the Geologic Atlas the results of these studies in the Coastal Plain and also of those relating to Allegany County, in western Maryland, including the Frostburg and Georges Creek coal basin.

Shaler party (Virginia).—Surveys have been continued in the Richmond, Virginia, coal basin. The field work has been completed and a report prepared, which appears in Part II of this Annual Report. The sequence of strata, including coal beds, has been worked out. The complex faulted structure has been determined, so far as possible with the data acquired, by detailed and painstaking examination, the facts being obscured by the uniformity of rocks throughout the series of strata and by superficial covering. A deep hole which is being drilled by private enterprise affords important data, which are communicated to Professor Shaler through the

courtesy of the owners. Similar information was given by Mr. W. K. Myers, of Hallsboro, Virginia. It is believed that the results of this survey will be of material value to operators in the Richmond coal field.

Eldridge party (Florida).—Mr. George H. Eldridge early in the fiscal year completed the surveys of the phosphate district, Florida, on which he had been some time engaged, and returned to Washington to prepare a report for publication. During the greater part of the winter he was engaged in the writing of this report, and he expected to complete it within the fiscal year, but in February it was found necessary to place him in charge of parties to explore Alaska. During March he was busy outfitting these parties, with which he sailed from Seattle on May 2.

For Mr. Eldridge's work in Utah, from August until December, see a paragraph under the heading "Rocky Mountain region," page 47.

INTERIOR OR MISSISSIPPI REGION.

Van Hise party (Lake Superior region, etc.).—Prof. C. R. Van Hise, assisted by Messrs. W. S. Bayley, J. Morgan Clements, and C. K. Leith, continued detailed surveys of the iron-bearing districts of Lake Superior. Field work was begun and continued throughout the season in the Vermilion Lake district, Minnesota. About 400 square miles, comprising half the district, were surveyed in extreme detail.

The general plan of the work in the Lake Superior region contemplates the publication of a monograph on each of the iron-bearing districts. At the close of this fiscal year (June, 1898) two of these monographs, those on the Penokee and Marquette districts, have been published; the manuscript and illustrations of a third, the Crystal Falls, have been accepted for publication; the field work of the fourth, the Menominee, is done and the report is in preparation; and field work in the fifth district, the Vermilion, is under way; the sixth district, the Mesabi, is untouched.

Professor Van Hise made an extended journey through western United States, pursuing general studies in structural and metamorphic geology. Sections were observed across the

Cascade Range, Washington; the Coast Range, Oregon and California; and the Sierra Nevada, California. The Grand Canyon district, Colorado, was also examined.

In cooperation with Mr. Keith, Professor Van Hise studied the Ocoee series and associated rocks in Virginia and Georgia. He directed the surveys of Prof. Florence Bascom in the vicinity of Philadelphia; and the material submitted by Professors Emerson, Dale, and Hobbs relating to the Housatonic quadrangle of western Massachusetts was referred to Professor Van Hise, who had spent some time in that field with each of the geologists named.

During the year Professor Van Hise has been engaged in the preparation of a treatise on Metamorphism of Rocks, has published (1) Estimates and Causes of Crustal Shortening, and (2) Metamorphism of Rocks and Rock Flowage, and has summarized the conclusions of the monograph on the Crystal Falls district. The latter appears in Part III of this Annual Report.

Darton party (Nebraska, etc.).—Mr. N. H. Darton, assisted by Mr. F. H. Ainsworth, was engaged during the field season chiefly in surveys in western Nebraska for the Division of Hydrography (see pp. 71, 74). The geologic results of these surveys consist of maps of the Camp Clark and Scotts Bluff quadrangles in detail, and a geologic reconnaissance map of the State of Nebraska. Extensive deposits of volcanic ash, which may probably have economic value, were discovered. The temperature of artesian waters of the Dakota basin has been found to present interesting phenomena, which are being investigated.

During intervals of office work Mr. Darton made additional trips in the vicinity of Washington and into the Monterey quadrangle, Virginia. The Washington folio is in a final stage of preparation, and the Monterey has been submitted for publication.

Hill party (Texas and Indian Territory).—Mr. Robert T. Hill has been engaged principally in office work, preparing papers in relation to the geology of Texas, though a portion of December, 1897, and January, 1898, was spent in the field in Texas.

Mr. Hill's reports on the geology of Texas will appear in part as follows:

1. In the Geologic Atlas, (*a*) the Nueces folio, which is printed and nearly ready for distribution; (*b*) the Brackett folio; (*c*) the Austin folio. The geologic maps of the Brackett and Austin folios are drawn and the descriptions are partially completed.

2. A report on the geology of the Black and Grand Prairie regions of Texas, including a discussion of the underground waters. Statistics of more than 3,000 artesian wells, ordinary wells, and springs in this region have been received and in part compiled. An appropriate base map, upon which the information will be platted, is in course of preparation.

3. An article on the physical geography of Texas has been written, and an elaborate map, on the scale of 25 miles to the inch, covering Texas and parts of New Mexico and Indian Territory, has been drawn by Mr. Selden from the best available data, including a large amount of material furnished by Mr. Hill from personal observation. This map and the accompanying description are to be published as a folio of the Topographic Atlas of the United States.

During the year Mr. Hill has received and read the proof of two papers by himself and Mr. Vaughan. One is entitled Geology of the Edwards Plateau and Rio Grande Plain adjacent to Austin and San Antonio, Texas, and appears in Part II of the Eighteenth Annual Report. It points out the distribution and availability of the underground waters of the region described, and incidentally it gives the details and structural geology of the Cretaceous and post-Cretaceous rocks and of the volcanic rocks of the region. The other paper is chiefly of paleontologic interest, being a discussion of the grypheate oysters of the Cretaceous formation of Texas. It will appear as Bulletin 151 of the Survey series.

During January Mr. Hill accompanied Mr. Willis in a general reconnaissance of Texas, extending from Paris to El Paso.

Vaughan party (Texas).—In July, 1897, Mr. Vaughan was occupied in the office in platting data for a geologic map of the Brackett quadrangle, to be published by Mr. Robert T.

Hill and himself as a folio of the Geologic Atlas. Mr. Vaughan then took six months' leave of absence without pay for the purpose of visiting Europe, to pursue his special studies of fossil corals. He returned in March, 1898, and after a short period of office work he proceeded to Texas to conclude the survey of the Uvalde quadrangle, upon which he had previously been engaged under Mr. Hill's direction. On June 27 Mr. Vaughan returned to the office, having finished the field work, and proceeded to prepare the data for folio publication.

Taff party (Indian Territory).—Mr. Joseph A. Taff, who had previously been engaged in work in the Appalachian coal field, in association with Mr. Campbell, was transferred in the spring of 1897 to independent work upon an important coal field in Indian Territory. From July to November he was engaged in field work in the McAlester and Atoka quadrangles, being assisted by Mr. George B. Richardson, and after his return to the office in December he began the compilation of his field notes and put the data in such condition that they may be transferred to the topographic sheets as soon as the latter are engraved. Engraving of the topography for the McAlester quadrangle is now in progress, and the folio for the Geologic Atlas will be prepared by Mr. Taff during the coming winter. Mr. Taff also prepared a paper on the McAlester coal field, which appears in Part III of this Annual Report.

About the middle of April Mr. Taff returned to the field, where he has since been engaged in extending surveys over the remainder of the Atoka quadrangle and into the Coalgate quadrangle. He is assisted by Mr. George I. Adams.

ROCKY MOUNTAIN REGION.

Emmons party (Utah, etc.).—Mr. S. F. Emmons was assisted throughout the year by Messrs. George W. Tower, jr., and George Otis Smith. Field work consisted in an economic survey of the Tintic mining district, Utah.

The Tintic is the most important mining district in Utah, not only with regard to the value of its product, but in the great variety of its minerals and the complicated structure of its ore deposits. The latter occur mainly in a small area of steeply upturned Paleozoic rocks, surrounded and partly cov-

ered by eruptive rocks, which themselves also contain some good ore deposits. The distribution of the various kinds of rocks was determined, and the eruptives were carefully studied. In the mines detailed studies were made of the relations exposed in extensive underground workings, the purpose being to ascertain the manner of formation and probable extent of the ore bodies.

Among the more striking results arrived at during the summer's work may be mentioned:

1. Contrary to what is usually the case in Western mining districts, there appears to have been no genetic connection between ore deposition and eruptive action, for it has been proved that the most important ore bodies—viz, those entirely inclosed in sedimentary rocks—were formed and eroded before the igneous rocks were erupted.

2. The complete independence of the ground-water level in the mines in sedimentary and those in igneous rocks. In the case of the former, a permanent water level has not been reached at depths of 1,200 to 1,600 feet, while in mines in the latter, not over 2 miles distant, water has been found at 200 to 700 feet. The absolute difference referred to sea level is much less, but of considerable amount.

3. As a consequence of the depth of the permanent water level in the former mines, their ores have been very largely oxidized, and in this process of oxidation there has been a remarkable separation of the minerals according to their metallic bases, lead ores predominating at one point, copper ores at another, and silver ores at a third.

Interesting observations of a more technical nature were also made upon the transition from one type of eruptive rock to another, by which it was conclusively proved that they must have originated in the same magma.

Field work was continued at Tintic till November 17, after which Messrs. Tower and Smith undertook comparative studies of other areas in the State for the purpose of correlating the sedimentary formations of the Tintic district with those that had previously been classified.

Late in July, after spending ten days at Tintic, Mr. Emmons visited the mining districts of Park City and Bingham Canyon,

in Utah, for the purpose of determining what areas should be surveyed topographically in case it should be found advisable to make economic surveys of these districts. He returned to Washington toward the end of the month and completed the proof corrections of the Butte folio.

During August, September, October, and the first half of November, Mr. Emmons visited Europe and was present, as Government delegate, at the Seventh International Congress of Geologists, whose sessions were held in St. Petersburg, Russia. Afterwards he took part in the geologic excursions made by members of the congress through southern Russia, the Caucasus Mountains, Transcaucasia, the Black Sea, and the Crimea.

Office work since the close of the field season has been directed to the preparation for publication of the results of the work in the Tintic district, and they are presented in a paper in Part III of this Annual Report. Mr. Tower has occupied himself mainly with the sedimentary rocks and the ore deposits. Mr. Smith has written upon the igneous rocks and the phenomena attending their eruption.

Mr. Emmons has been occupied during the season of office work in a more exact study of the material gathered at Butte, Montana, for the purpose of making a somewhat critical and detailed report on the vein structure and filling of that district. During January and February he compiled, in accordance with the Director's instructions, a brief report on the geology and mineral resources of Alaska, to accompany a map ordered by joint resolution of Congress. He has also spent considerable time in other work of an administrative nature, with special reference to the economic investigations of the Survey.

Weed party (Montana).—Mr. Walter H. Weed was assisted in the field by Messrs. L. S. Griswold and R. H. Sales. Field work was continued in the vicinity of Butte, Montana, for the purpose of mapping the areal geology of the Boulder quadrangle. The Boulder quadrangle is the southeast quarter of the Helena quadrangle, the former being topographically surveyed on a scale of 2 miles to 1 inch, and comprising about 840 square miles, the latter on a scale of 4 miles to 1 inch. The Boulder quadrangle lies almost wholly in western Jeffer-

son County. It includes important mining districts. Additional field work was done in the Little Belt Mountains and Fort Benton quadrangles in the vicinity of Neihart, in Fergus, Cascade, and Meagher counties.

In September a trip was made to the Yellowstone Park and a fortnight devoted to a study of the changes that have taken place in the geysers and the hot springs of the region since the suspension of the work of the Survey in that field in 1891. These changes proved to be of great importance and will materially affect the conclusions presented in the final report on the region.

In the office Mr. Weed prepared and submitted for publication as folios of the Geologic Atlas the maps and descriptions relating to the Little Belt Mountains and Fort Benton quadrangles. The materials acquired by the survey of the Boulder quadrangle were studied, but the final report awaits further field work on the general geology and mines. On May 23 Mr. Weed proceeded to Montana to undertake this field work.

Hague party (Yellowstone National Park, etc.).—Mr. Arnold Hague left Washington July 1, 1897, to proceed to Bozeman, Montana, for the purpose of equipping a party to complete the areal surveys of the Absaroka Range, lying due east of the Yellowstone National Park. Dr. T. A. Jaggar, of Harvard University, and Dr. F. P. King accompanied him as geologic field assistants. The party marched from Bozeman by the way of Gallatin Valley to the Yellowstone Park, thence across the park to the foothills of the Absaroka Range. Three months were spent in the mountains, and the party returned to Montana early in October.

Geographically and geologically the Absaroka Range bears the closest relation to the Yellowstone Park. It presents a broad elevated mountain mass along the entire eastern side of the park, and for many years offered an effectual barrier to all exploration of the park country from the east. The Yellowstone Park Forest Reserve, the first reserve set aside by President Harrison under the act of March 3, 1891, adjoins the park on the east and south, and includes the greater part of the Absaroka Range lying east of the park boundary. This reserve has always been considered in a somewhat different

light from the others, and has been placed under the supervision of the superintendent of the park. It is quite likely that at some future time it will be included within the park area by Congressional action. Geologically the Absaroka Range stands closely associated with the park country, as the western slopes and several of the more elevated peaks lie within the park. For a correct understanding of the geologic conditions of that portion which lies within the park a knowledge of the whole range is indispensable. The park and the immediately adjacent country was the scene of great volcanic activity throughout Tertiary time, and the building up of the Absaroka Range forms a most important chapter in the geologic history of the region.

During the earlier study of the park country Mr. Hague made frequent explorations from time to time into the region of the Absarokas, each time returning with new and important material. The first of these expeditions was made as early as 1885, and was followed by trips made each season for several years. The systematic examination of the Absarokas began in the year 1893. The further progress of the work was delayed until 1897, when it was again taken up and after an arduous summer was completed during the last field season. The country surveyed is embraced within the Crandall Creek and Ishawooa quadrangles. During the past winter and spring the geologic sheets representing these quadrangles have been prepared and submitted for publication. The entire Absaroka Range from north to south is so bound together in its geologic features that the plan is to publish these two sheets and accompanying texts jointly under the title of the Absaroka folio. The range consists of a vast accumulation of breccias, agglomerates, and mud flows, somber in color, with interbedded sheets of basalt. The basaltic outbursts increase in number and in volume until finally they attain a thickness of over 1,000 feet, designated as the early basalt sheets. These breccias and basalts were poured forth from numerous vents and fissures until the range assumed the appearance of a vast pile of nearly horizontal masses of fragmental material, separated by flows of more solid basic lavas. The different phases of volcanic phenomena have been carefully worked out, and the age

of eruption has been in great measure determined by a rich and varied flora of early Tertiary time. After the cessation of volcanic energy which built up this pile of andesitic and basaltic flows, another phase of eruptive energy followed, quite unlike those which had preceded. Vast bodies of gabbro, diorite, granite, granite-porphyry, and andesite were intruded into the breccias. They formed new vents for themselves, quite independent of the breccia centers of activity. In most instances these masses never reached the surface. They occur as massive stocks or laccoliths, penetrating the early fragmental material. These more recent eruptive phenomena make the Absaroka Range one of great geologic interest, presenting many facts in volcanic geology not heretofore described. The explanatory text to accompany the Absaroka folio is in progress and will be completed at an early date.

During the winter and spring much time has also been given to the preparation of a monograph on the Yellowstone Park. The chapter on the geologic history of the Absaroka Range, which forms a part of the monograph, will embrace the principal physical features of the entire range, and will not be confined to that portion lying within the limits of the park. This will be a decided advantage to the work.

In addition to other work, much time has been expended on the preparation of a geologic model of the park and the Absaroka Range. The contrast between the approximately level plateau of the park and the deeply trenched plateau which forms the Absaroka Range will be well brought out. The model is in an advanced state of preparation, a topographic model having already been completed and forwarded to the Omaha Exposition.

From time to time work has been given to the labeling of the Yellowstone Park collections. This work, which was begun last year, is now completed so far as the crystalline and sedimentary rocks of the collections are concerned; there remain only the collections illustrating the hydrothermal deposits in the neighborhood of the geysers and hot springs.

During the year Dr. Jaggar has given considerable time to the work in connection with the geology of the Absarokas. At the present time he is engaged in preparing a petrographic

report on the igneous rocks of the region. Large collections were obtained both in 1893 and in 1897, and these are being carefully studied.

Hills party (Colorado).—Mr. R. C. Hills continued office work from time to time on the maps and descriptions of the Elmoro, Spanish Peaks, and Walsenburg quadrangles, which he has surveyed under special arrangement with the Survey. The material for the Elmoro folio was completed and submitted.

Cross party (Colorado).—Mr. Whitman Cross was assisted in field and office by Mr. Arthur C. Spencer, and in the field by Messrs. John D. Irving and William T. Lee also. The party was in the field from the latter part of June until November 15. Its energies were directed to mapping the sedimentary and volcanic formations of the La Plata, Durango, and Rico quadrangles, Colorado, covering portions of Dolores, Montezuma, and La Plata counties, in the San Juan Mountains.

An important section of sedimentary rocks, comprising a complete series from the basal granite to the Animas formation, of post-Cretaceous age, is exposed in the hills adjoining the valley of Animas River in the Durango quadrangle. Upper Cretaceous and Devonian horizons were satisfactorily identified by fossils collected during the last season. The western portion of the Durango quadrangle contains many igneous intrusions from centers in the La Plata Mountains. Mines of importance are situated on the eastern side of the mountains within this area. In the southern part of the quadrangle occur valuable coal seams of Upper Cretaceous age.

The geology of the Rico quadrangle is comparatively simple. It comprises sedimentary formations from the Juratrias to the Mancos (Cretaceous). Near Rico many intrusive igneous rocks occur. There are important silver mines in that region, and there is a particularly complex distribution of rocks due to folding and landslides. This limited area in the vicinity of Rico has been deemed of sufficient importance to be made the subject of a special survey to be undertaken in the coming fiscal year. The ordinary work upon the Rico quadrangle has been completed.

Office work was directed toward the preparation of the accumulated field material for publication. The Telluride folio of

the Geologic Atlas was revised in some particulars, and is in process of engraving. Maps and manuscripts for the La Plata folio will shortly be submitted. The specimens and notes of the Durango and Rico geology have been arranged, and the nature of the problems to be studied during the coming field season have been considered.

Mr. Cross has acted as chairman of two committees, that on Petrographic Reference Collection and that on Chemical Analyses of Rocks, and as a member of the Committee on the Nomenclature of Igneous Rocks as used in the folios of the Geologic Atlas.

Eldridge party (*Utah*).—By special order of the Secretary of the Interior, Mr. Eldridge was assigned to an investigation of the asphaltic minerals in the Uinta and Uncompahgre Indian reservations, Utah. He was engaged in this work from August to December, inclusive. His report to the Secretary covered the geologic associations, occurrence, extent, and economic value of the minerals, with notes on the technology of the industry, and was accompanied by maps and sections.

PACIFIC REGION.

Lindgren party (*Idaho, etc.*).—Mr. Waldemar Lindgren was assisted during the field season by Messrs. F. C. Schrader and N. F. Drake. Surveys were made of the Silver City and Nampa quadrangles, comprising about 1,850 square miles, covering parts of Owyhee and Ada counties, Idaho. The mapping of these folios has furnished many needed data for the Tertiary history of Snake River Valley and shown how the old granitic ranges of that region were flooded by lavas and then partly submerged by the waters of a great fresh-water lake, reaching its maximum extent during the early Neocene period and being gradually drained during the latter part of the same period. Fossils of many kinds were collected from these lake beds and have been examined. A reconnaissance was made in western-central Idaho over an area of about 6,000 square miles, which furnished the key to the origin of many of these phenomena. The route followed extended from Weiser northward to the vicinity of Florence and returned to Boise. The canyon of the Snake River was explored as far

north as Seven Devils. This reconnaissance was carried on near the line where the great Columbia lava flows rest against the older ranges of granite and slate in the Idaho side, and showed that the cause of the great fresh-water lake was to be found in the immense lava masses barring the comparatively narrow outlet of a wide pre-Neocene valley. It was also found that since Neocene times the Snake and Salmon rivers have cut gorges from 4,000 to 6,000 feet deep through these lava barriers, equaled in grandeur by few canyons of the West.

The examination of the Silver City mining district resulted in the discovery of many features of great interest to mining geology. The deposits are veins, carrying gold and silver; they are of comparatively recent age, cutting granite, basalt, and rhyolite. In some the occurrence of orthoclase as an abundant gangue mineral was established, a feature observed for the first time in vein geology. In others a complete transformation or pseudomorphism of a primary gangue mineral, probably calcite, to quartz was noted. Finally, quartz deposits were found carrying gold and silver and at the same time including imprints of vegetable organisms—a proof of their aqueous origin.

In November, by special order of the Secretary of the Interior, Mr. Lindgren proceeded to the Chiricahua Range in southeastern Arizona, where a reconnaissance of the range was undertaken and a complete geologic survey made of Ts. 17 and 18 S., R. 30 E., with a view to determining their mineral or nonmineral character. During the work in this region a complete section was obtained, incidentally, across the mountains, showing crumpled Carboniferous rocks submerged by lavas of unusual and interesting character.

In the office a report of the results of the Arizona work was prepared and submitted, and proofs of the Truckee folio were read. Mr. Lindgren has been steadily engaged in the preparation of maps and descriptions of the Colfax quadrangle, California, and the Silver City and Nampa quadrangles, Idaho, as well as a report of the results of his reconnaissance in central Idaho. He published during the year in the Engineering Magazine, printed at Stanford University, an article on the

Gold Deposits of the Sierra Nevada, and in the American Journal of Science, June number, a short account of Orthoclase as Gangue Mineral in a Fissure Vein.

Branner party (California).—No allotment was made to Prof. J. C. Branner for his own work in the Palo Alto and adjoining quadrangles, California. Attention was called by Mr. H. W. Turner to surveys already accomplished by Mr. Harold Fairbanks in the vicinity of San Luis Obispo for the area covered by the four quadrangles San Luis Obispo, Rio Grande, Fort Harford, and Cayucos. Mr. Turner recommended that this material should be secured for publication as a folio of the Geologic Atlas, and, his recommendation being approved, a sum was allotted for this work, to be expended under the direction of Professor Branner. Mr. Fairbanks accordingly made additional surveys and compiled the maps and manuscript, which have been received with Professor Branner's recommendation for publication. The folio will be known as the San Luis folio of the Geologic Atlas.

Turner party (California).—Mr. H. W. Turner organized his party for field work late in June of the last fiscal year, with Dr. W. S. T. Smith and Messrs. G. P. Louderback and R. S. Garfield as field assistants. The field of operations was the Yosemite quadrangle, California, covering the Yosemite Valley and vicinity. Work was commenced July 7 and closed October 15. About 486 square miles, comprising the northern half of the Yosemite quadrangle, were geologically mapped.

The geologic features of the Yosemite quadrangle, to which attention is particularly directed by their unusual development, are the jointing of the massive granitic rocks and the development of glacial phenomena. Mr. Turner made special observations with reference to these phenomena, and secured the advantage of association with Professor Branner, an expert in glacial geology, and with Professor Van Hise, a special student of structural geology, including jointing of rocks.

From the studies of the evidence of glacial occupation it appears probable that there have been in that district two periods of ice expansion, with an interglacial period. During the interglacial period the river basins were greatly deepened.

The two great glaciers of the district, the Tuolumne and Merced glaciers, were found to have extended farther west than had been previously supposed. An older course of the Tuolumne River, occupied during Neocene time, was traced across the quadrangle, approximately along the line of the present valley of the Tuolumne. This older course includes the Hetch-Hetchy Valley, which was then, however, much shallower. The Yosemite Valley may correspond to an older valley which the Merced followed during the Neocene period, but has been greatly deepened since then.

During June Dr. Smith was engaged in mapping the geology of the Yosemite quadrangle.

In the office Mr. Turner has revised the manuscripts for the Downieville, Bidwell Bar, and Sonora folios, which have been published. He has also published short articles on The Classification of Igneous Rocks, and Notes on Rocks and Minerals from California, and served as a member of the Committee on Nomenclature of Igneous Rocks as used in the folios of the Geologic Atlas.

Diller party (Oregon).—Mr. J. S. Diller continued his work in southern Oregon, and was assisted, as in former years, by Messrs. A. J. Collier and James Storrs. Additional investigations were made of certain features of the Roseburg quadrangle, consuming a few days at the beginning of the field season. The survey of the Coos Bay quadrangle was then taken up and completed. Special attention was given to the Coos Bay coal field on account of its economic importance.

The coal-bearing formations in the Coos Bay quadrangle occur in four basins—the Newport, the Beaver Slough, the South Slough, and the Coquille, all of which afford conditions more or less favorable for mining. The Newport basin is smallest, but, having its bottom above the general drainage, is well situated for economic mining. At least half of the coal of this basin has been removed in the last forty years, and the other portion is easily available. The Beaver Slough basin is most promising in its southern portion, where it is greatly expanded and contains the greatest body of coal. The South Slough basin is too deep and the coal too much disturbed to pay for mining in its northern part, but to the south the basin

rises and may afford a profitable field. In the Coquille basin, which is one of the smallest, the central portion is most promising.

In the office the Roseburg folio was prepared, and is now in course of publication as part of the Geologic Atlas. Bulletin 150, which contains a description of the Educational Series of Rock Specimens, was read in proof. One hundred and seventy-four collections of these series were distributed to the higher educational institutions throughout the country, and the seventy-six remaining collections have been made ready for distribution this summer.

Mr. Diller has served as chairman of the Committee on Petrographic Laboratory and as a member of the committees on Analyses of Rocks and on Nomenclature of Igneous Rocks as used in the folios of the Geologic Atlas. Messrs. F. C. Ohm and W. S. Robbins have been employed in the laboratory, of which Mr. Diller has special charge. Nearly 3,700 thin sections have been made, and many specimens otherwise prepared for investigation.

Willis party (Washington).—The field of work specially assigned to Mr. Bailey Willis lies in western Washington and comprises the Cascade Range and Puget Sound district. Mr. Willis was prevented by administrative duties from taking that distant field, but Prof. I. C. Russell proceeded under his general instructions to survey the Mount Stuart quadrangle, an area of about 1,000 square miles on the eastern slope of the Cascade Range in Kittitas County, Washington. Professor Russell crossed the Cascade Range and spent three months in the investigation of the particular district assigned him. The geologic phenomena of the Mount Stuart quadrangle are grouped about a central mass of granite, and include highly metamorphosed rocks surrounded by Eocene and Neocene sandstones and coal measures. The phenomena of igneous intrusion are complex, and there are important mining prospects in the Pechastin Range.

Mr. Willis remained in the office in charge of his duties as acting editor of topographic maps and as editor of geologic maps until August 12, when he was relieved of the details of that work by the return of Mr. Marcus Baker, editor of topo-

graphic maps, who had been on leave of absence, and the appointment of Mr. George W. Stose as editor of geologic maps. Mr. Willis remained in general charge of map editing until the appointment, on April 16, of the Committee on Map Editing and Printing.

The preparation of maps and sections for publication in the Geologic Atlas, and other drafting related to the geologic work of the Survey, has been performed in part by Messrs. O. A. Ljungstedt and H. S. Selden. With the close of Mr. Willis's relations to the editorial work these two gentlemen were assigned to the Section of Geologic Map Editing, under Mr. Stose.

Mr. Willis pursued his scientific work (1) in the study of problems of physiography and Pleistocene geology, with reference to the results obtained in the survey of the Tacoma quadrangle, Washington, and (2) in structural geology. He has published an article on The Drift Phenomena of Puget Sound, and under his direction Mr. George Otis Smith has prepared maps which will be published in the Tacoma folio of the Geologic Atlas. The description of the quadrangle will be written during the coming summer.

In execution of his duties as assistant in geology to the Director, Mr. Willis has performed considerable administrative work. In January he visited Texas with Mr. Robert T. Hill and made a general examination of the central and southwestern portions of the State for the purpose of ascertaining the character of the topographic and geologic work that had been done and in which directions it would be best to continue it. Attention was also given to the order of the publication of the accumulated results of the surveys Mr. Hill has made during the last fifteen years. A report on this subject was made to the Director in February.

Mr. Willis has served as a member of the committees on Analyses of Ores, Analyses of Rocks, and Petrographic Laboratory, as well as of several temporary committees appointed to pass upon manuscript submitted for publication.

Becker party (California).—Mr. George F. Becker made an examination of the Mother Lode of California from Plymouth

southeastward. He was assisted by Dr. F. L. Ransome. The purpose was to elucidate the character and origin of the fissures in which the gold deposits of the lode occur, and so far as possible also the physical conditions attending ore deposition. All the mines except one, to which admittance could not be obtained, were examined, but at the close of the season, in September, several broad questions of structure remained to be solved during the coming season. A special topographic map on a large scale has been prepared to illustrate Mr. Becker's report.

Mr. Becker made short trips to the Grand Canyon of the Colorado, in search of information on rock pressure, and to Cripple Creek, Colorado, for the purpose of comparing the occurrence of telluride ores in that district with that in California.

In the office Mr. Becker has been engaged in the compilation of his observations on the gold deposits and the more general occurrences of the native metals of the United States and elsewhere.

ALASKA.

Messrs. George H. Eldridge, Josiah E. Spurr, and Alfred H. Brooks were assigned from the geologic corps to special explorations in Alaska. Mr. Eldridge has general charge of the combined Alaskan parties, and Mr. Spurr is in charge of the party to explore the valley of the Kuskokwim. After separating from Mr. Eldridge, Mr. Brooks proceeded with a party under Mr. Peters, topographer. A fuller account of the routes and purposes of these explorations is given under the heading "Division of Topography," on pages 116–117.

Messrs. W. C. Mendenhall and F. C. Schrader were assigned to work in Alaska in response to a request from the War Department, and are engaged with the parties sent out by that Department in the region between the Copper and Sushitna rivers.

GLACIATED REGION.

Chamberlin party (northern United States).—Prof. T. C. Chamberlin has been privately as well as officially engaged for a number of years in special studies designed to determine cri-

teria for mapping the complex and obscure formations due to the great ice sheets which formerly covered Canada and northern United States. He has been assisted by a number of trained associates, and their results have been arranged in manuscripts, some of which have been offered for publication by the Survey, while others are in preparation.

During the last year Mr. Frank Leverett has been occupied in completing a monograph on the formations of the Illinois glacial lobe and its attendant waters, including the associated interglacial formations. This constitutes an elaborate thesis of 1,169 manuscript pages. In writing this work Mr. Leverett occasionally revisited the field for the purpose of rendering his data more complete or of verifying the grounds of his conclusions.

Mr. William C. Alden, with the temporary aid of Messrs. W. W. Atwood, C. F. Tolman, jr., and N. F. Fenneman, has completed surveys of the Chicago, Des Plaines, Calumet, and Riverside quadrangles, and has prepared the texts to accompany them. These results will be published as a folio of the Geologic Atlas.

All of this work has been done under the supervision of Professor Chamberlin, in whose hands the manuscripts now are for examination.

Gilbert party (Great Lakes region).—Mr. G. K. Gilbert was occupied in work for the Survey during the months of July, August, and September, 1897, and January, May, and June, 1898. During the other six months of the fiscal year he was absent on leave without pay.

Field work was carried on in western New York in the group of quadrangles lying north of latitude 43° and west of longitude 78° 30′. These are the Wilson, Olcott, Lockport, Tonawanda, and Niagara Falls quadrangles. The work was directed to the gathering of data appropriate for publication in folios of the Geologic Atlas, consisting of the facts of distribution of the Paleozoic and Pleistocene formations.

Mr. Gilbert has made a special study of earth movements in the region of the Great Lakes, as deduced particularly from records of the levels of the lake waters read under the super-

vision of the officers of the Engineer Corps of the United States Army. In this connection additional data which were necessary were furnished by Col. Jared A. Smith, of the army engineers, and Mr. M. E. Rawson, city engineer at Cleveland.

Cooperation was arranged with the geological survey of the State of New York, by which the United States Survey is to receive for publication the results of an investigation of the geology of Erie County, by Prof. I. P. Bishop. A portion of Erie County falls within a group of quadrangles which Mr. Gilbert is engaged in surveying, and by this cooperation duplication of work is avoided. On the other hand, the area of these quadrangles covers nearly the whole of Niagara County, and it is agreed that Mr. Gilbert shall survey the remaining portion of Niagara County in the Medina and Ridgeway quadrangles, and shall furnish to the State survey for its reports a geologic map of Niagara County.

In the office Mr. Gilbert continued work in July, 1897, on the manuscript on Recent Earth Movements in the Great Lakes Region, which was published in the Eighteenth Annual Report, Part II. This included some of the results of the researches of Mr. E. L. Moseley. Mr. Gilbert was also engaged in work on the geologic map for the Apishapa folio, Colorado. The geologic work had been completed several years ago, but the compilation awaited the results of recent topographic surveys.

Mr. Gilbert's investigation of the oscillations of the water level in the Great Lakes indicated the need of more systematic, elaborate, and precise observations than had hitherto been made. The records already accumulated had been gathered by members of the Engineer Corps of the Army, and it seemed desirable that the work should be continued by that corps rather than by the Geological Survey. Accordingly, early in August, 1897, the matter was submitted through the Director to the Chief of Engineers, Gen. John M. Wilson. The suggestion met with his approval, and the endeavor was made to have the work initiated in the summer of 1897. Technical obstacles caused another delay, but these

were overcome during the year, and it is now believed that the first set of more accurate observations will be obtained this summer.

FIELD AND OFFICE WORK BY THE DIRECTOR.

The field work of the Director consisted mainly in the examination of certain forest reserves in the Northwest, an inspection of the Yellowstone and Yosemite national parks, and geologic reconnaissance work in eastern California. Early in August, accompanied by Mr. F. B. Weeks, as secretary and field assistant, he made a somewhat thorough examination of the area included in the Black Hills Forest Reserve. At Deadwood a study of the geology of the immediate vicinity was undertaken, including a visit to the celebrated Homestake mine, where, through the courtesy of Superintendent Greer, the interior of the mine was visited. Collections of fossils were also made in the vicinity of Deadwood and on the southern side of the Hills in Red Rock Canyon.

The next stop was at Sheridan, Wyoming, where a camp outfit was secured for a trip through the Bighorn Mountain Forest Reserve. After an examination of the portion of the reserve lying north of Cloud Peak a visit was made to the reported gold-bearing rocks of Bald Mountain. A collection of rocks and fossils was secured from the Paleozoic formations lying on the eastern flanks of the Bighorn Mountains.

The next stopping place was at the Yellowstone National Park. Under instructions from the Secretary of the Interior an examination was made of those portions of the park usually visited by tourists. Col. S. B. M. Young, acting superintendent of the park, was most obliging in furnishing assistance and information, and accompanied the party on most of the trip. Mr. S. S. Huntley, manager of the transportation company, also extended many courtesies. A report was made to the Secretary of the Interior, from which the following extracts are taken:

Roads.—The most serious annoyance met with is the dust, which rises from the roads in the form of an impalpable powder that is both stifling and blinding. This condition arises from the nature of the material of which the roads are constructed and can be prevented only by proper surfacing with material that will form a hard road bed. It is probable that such material can be found within the limits of the park.

In addition to the dust nuisance, many of the road grades are very steep, and steps should be taken as soon as possible to improve them from the entrance to the park at Gardiner to the Golden Gate. This means practically the reconstruction of 10 miles of road. The general grade and construction of the road from the Golden Gate to the Upper Geyser Basin, thence to the Lake, the Canyon, and back to the Norris Basin, is fairly good. Such improvements as are necessary could readily be made by the force annually employed in the repair of roads.

The most uninteresting portion of the route followed by the tourist in the park is from Canyon Hotel to the Norris Geyser Basin and thence back to the Mammoth Hot Springs. By the construction of a road from the termination of the present road at Inspiration Point, on the Grand Canyon of the Yellowstone, down the river to Yancey's and thence along the river to Deer Creek, where the road would join the Cook City road, the tourist would pass through one of the most interesting portions of the park. Leaving the Canyon Hotel, the present road could be followed to near Inspiration Point, and thence extended a short distance back from the canyon to the foot of the eastern spur of Mount Washburn. It can be carried around this spur near the brink of the canyon at an elevation of only 300 feet above that of the Canyon Hotel, and thence by a grade not to exceed 5 per cent down the slope of Antelope Creek to Tower Creek, where there is a beautiful view of the Yellowstone Canyon and Tower Falls. Considerable heavy work will have to be done in the vicinity of Tower Falls, but I think it is feasible to construct a safe road, and from that point to Yancey's little difficulty will be met with. The view from the point where the road would round the spur of Mount Washburn is one of great extent and beauty. To the southwest is the broad expanse of Hayden Valley, surrounded by mountain ridges and peaks; to the east is the great valley and canyon of the Yellowstone; to the north the broad, gently sloping valley of Antelope Creek with its beautiful open parks, and beyond, across the canyon, a high group of peaks and ridges that cluster together in the northeast portion of the park. From Yancey's to Mammoth Hot Springs the proposed road follows the Yellowstone River nearly 10 miles and passes by an easy grade to the junction of the present Cook City road at Deer Creek. From Deer Creek the road extends along the southern base of Mount Evarts, passing Undine Falls, and thence down the canyon to Mammoth Hot Springs. Views of great extent and beauty occur at numerous points both along the river and above in the canyon of Lava Creek.

I passed over the line of the suggested road from the canyon to Yancey's, and also made frequent detours to the brink of the canyon and examined carefully the localities where it was anticipated there would be great difficulty in construction. The first 10 miles of the road, before reaching the eastern termination of the spur from Mount Washburn, can be built without meeting any considerable obstacle other than grading along steep slopes. There is a most excellent grade around the point of the spur, and little difficulty will be met with at this point, where it had been anticipated much heavy work would have to be done.

When it is considered that during the present season between 6,000 and 7,000 people will have passed through the park, it seems most unfortunate that, owing to the absence of a good road from the canyon to Yancey's and thence to Mammoth Hot Springs, tourists are prevented from seeing some of the most striking and beautiful scenery in the park. They take a rather monotonous route from the canyon to the Norris Geyser Basin, and thence to the Mammoth Hot Springs.

In addition to the road along the Yellowstone Canyon, I think it would be a great addition to the park to have good horse trails constructed to some of the prominent peaks and points of interest. For instance, a trail from the road north of Mammoth Hot Springs to the summit of Bunsen Peak, and thence down Gardiner River past Osprey Falls; another from the same road to the summit of Electric Peak; another from canyon to the summit of Mount Washburn, etc.

Hotels.—The next most annoying feature, after the road dust, is the absence of a hotel at the Upper Geyser Basin. Under present conditions the tourist starts from the Fountain Hotel at the Lower Geyser Basin, rides 9 miles over dusty roads to

the Upper Geyser Basin, sees the most noted geysers of the park in the glare and heat of midday, and returns to the Fountain Hotel for the night. Early the next morning he is called and starts from the Fountain Hotel at the Lower Geyser Basin for a drive of 50 miles to the Lake Hotel. The first 9 miles of the distance is a repetition of the drive of the previous day, from the Lower Geyser Basin to the Upper Geyser Basin. The tourist not only takes the 18-mile extra ride over the dusty road, but also loses the beautiful morning and evening views of the geysers. It is true that the hotel company have a large hotel at the Lower Geyser Basin, but for the convenience of the thousands of people who pass through the park, a hotel should be erected at the Upper Geyser Basin at once, so as not to compel tourists to ride over the 18 miles and lose the best portion of the day in which to see the geysers in consequence of being compelled to return to the Fountain Hotel for lodging. The existing hotels are excellent—in fact, far superior to what might be anticipated when the conditions under which they are carried on are considered.

Transportation.—As the result of my personal observation and from conversations with many persons I am led to believe that the facilities afforded by the Yellowstone National Park Transportation Company are ample, and that the management is satisfactory.

The Wiley Camp and Transportation Company appears to meet the wants of a number of tourists. It is less expensive, and gives a week of camp life.

Guarding the park.—Some attention was also given to the question of protecting the game and policing the park. It is very evident that the present force is inadequate for the purpose, and that at least 100 more soldiers should be assigned to the park patrol during the summer months. While it is true that it would be impossible with a thousand men to guard all the possible approaches to the park by which poachers or persons accustomed to mountain life might penetrate it, there is no doubt that by establishing a few more stations the park could be much more thoroughly protected.

At present all persons entering the park are required to register, whether they come as campers or tourists in charge of the transportation company. I think this system should be extended so that all persons entering the park, under whatever conditions, would be required to register and take cards to show that they have registered and obtained permission to be in the park, the cards to be shown at the regular road stations and whenever demanded by the patrol. This would, I think, prevent irresponsible parties entering the park, either with good or with bad intentions, as they would be liable to arrest if unprovided with a permit. The recent "hold up" is a good illustration of the necessity of such a regulation, and it would also have an effect in preventing poachers moving about under the guise of tourists.

Minor notes.—It impressed me that it was most unfortunate that buildings had been constructed along the base of the Mammoth Hot Spring terrace on the west side of the roadway. If practicable these should be removed, and also the old unused barracks at the base of the south slope of the terrace. Numerous dead trees occur on the summit of the terrace, which mar the scenery and give an impression that this unique and wonderful natural phenomenon is not properly cared for. This does not refer to the trees killed by the hot springs and standing in the "formation."

Another important matter is the removal of the dead trees that are piled up along the roadside for many miles in different portions of the park. They disfigure the road, and in the event of a forest fire they would spread it very rapidly. They are like a tinder box, ready for the match that may be thrown into them, either by accident or design.

I notice that during the present season several guard rails and platforms have been built for the convenience and protection of the tourists along the canyon in the vicinity of the Falls of the Yellowstone. This good work should be continued until all the dangerous points in the vicinity of the geysers, springs, and canyons are properly guarded.

Colonel Young has the welfare of the park constantly in view and is doing much to improve its administration. If he does not remain in charge another year I think

it would be wise, in view of the numerous engineering problems presented by the construction of roads in the park, that when a new acting superintendent is appointed he be a member of the Engineer Corps of the Army. An active, energetic officer, retained in the position for several years, could do a great deal to improve the park. Much has been accomplished in the past, and is being accomplished at present, to develop and render accessible this wonderland of America, but there is considerable still to be done to make it thoroughly worthy of being a park in charge of the National Government.

The journey was continued westward from the Yellowstone National Park, and a short stop was made at Spokane. It was the intention to visit the Washington Forest Reserve, but owing to heavy and continuous storms this was abandoned after waiting a few days at Seattle.

A stop of a day was made at San Francisco, and the journey then continued to Wawona, California, where Capt. Alexander Rodgers took charge of the party in a trip through the Yosemite National Park. The results of this trip are indicated in the following extracts from a report to the Secretary of the Interior:

Roads.—The roads in the park are owned by private parties, with the exception of those in the Yosemite Valley, which are controlled by the State of California. The usual route followed by tourists into and through the valley is a well-graded and good road. There are two other good roads that enter from the western side—the Big Oak Flats and Colterville roads. These are not in as good condition as the Wawona road, but they are largely used by campers entering the park from the San Joaquin Valley. There is a third road, the Tioga, which has practically been abandoned. This extends from the northeastern corner of the park, and if opened up would give access to a very interesting portion of it. At present there is an agitation to continue this road through the Mono or adjacent pass to the Mono Lake Valley. This would provide a means of access to the park from the eastern side.

The trails within the Yosemite Valley area are controlled by the State and are in good condition. The other trails through the park have had very little work done upon them, although they are fairly good as mountain trails go.

It is difficult to make any recommendations in relation to the wagon roads, owing to the fact that the State owns and controls the roads through the park, and the remaining roads were built by private parties. The trails will be mentioned under the head of recommendations as to what should be done to improve the park and make it more accessible to tourists and campers.

Administration.—The administration of the park, exclusive of the Yosemite Valley, which is under State control, appears to be as effective as the force and means of communication will permit. The opening up of the outlying districts by the construction of good trails and a telegraph or telephone line will greatly add to the thoroughness of the patrol and care of the park. The force at the disposal of the acting superintendent is too small under existing conditions to patrol the park thoroughly.

RECOMMENDATIONS.

New buildings at camp near Wawona.—In view of the fact that the acting superintendent and the troops are assigned to duty in the park when the weather is cold in the spring and kept there until late in the fall, it is exceedingly desirable that a permanent building be erected at the main camp. At present the troops are quar-

tered in tents and temporary structures erected by them, and the latter are usually destroyed by campers and others while the men are absent during the winter. The erection of a building to cost not more than $1,000 would give storage to considerable Government property which is transferred back and forth from San Francisco to Wawona. It could include a reading room for the troops, to be used during the cold evenings of spring and fall, and quarters could also be provided for the surgeon and field hospital. It would be necessary to employ a keeper during the winter months.

Construction of trails.—A system of trails, consisting of a trail running around the park, inside the boundaries, with other trails to important points, and including substantial log bridges over main streams on account of high water in spring and early summer, appears to be one of the most pressing needs of the park. These trails should be laid out by some officer thoroughly familiar with the topography of the park and the localities which should be reached. It is probable that from 225 to 250 miles of trails will be required.

Construction of telephone or telegraph line.—A telephone or telegraph line should be built along the line of the trails connecting the central stations or patrol posts, of which there should be at least six. Field telephones or telegraph instruments should be provided for each detachment, in order to tap the wires at any point. These will assist in arresting trespassers and in sending word of forest fires, and will enable the superintendent to determine the efficiency of the patrol and to have the troops under constant control. At each of the principal stations a substantial log cabin should be erected, for the shelter of the men and for storing necessary supplies.

Increase of patrol force.—With one troop it is practically impossible to patrol the park thoroughly. This is especially true when the officer in charge and the men are changed and a new force comes in. If it were possible always to have two troops on duty and change one at a time, so that new officers and men could be trained to their duties by a troop that has already had the experience, great benefit would result. Under the present system the assigning of a new troop to the park makes it necessary that the greater portion of the season shall be taken up by both officers and men in acquainting themselves with their new duties, for it is particularly difficult in a mountainous and forested region to become familiar with the trails and numerous points which need greatest attention.

Pasturage.—After passing through portions of the Sierras where the pasturing of sheep and cattle is going on, and through the park where it is prohibited, I am strongly in favor of continuing the exclusion of both cattle and sheep from the limits of the park.

Surveys.—About one-half of the park has been topographically surveyed by the Geological Survey. This work should be continued, so that a good base map of the entire park will be available. It is also desirable that the boundaries of the park shall be properly monumented. This could be done in connection with the topographic surveys if the authority and the money for it were provided.

A trip was next made to Owens Valley, which was reached from the Yosemite Park through Mono Pass. A camp outfit having been obtained at Big Pine, the road to Saline Valley over the Inyo Range was followed as far as Waucobi Spring. An examination was made of the eastern slope of the Inyo Range and of the region eastward to the Saline Mountains. On the return to Owens Valley the western side of the Inyo Range was examined to a point opposite Independence station.

The return trip was made by way of Owens Lake to Mojave

and thence to Los Angeles. The southwestern portion of the San Bernardino Forest Reserve was visited before returning eastward to Denison, Texas, where a stop was made to examine the progress of the land and topographic surveys of the Indian Territory, under the charge of Mr. Fitch.

In June a short trip was made to southwestern Virginia for the purpose of examining certain sections in the vicinity of Lexington which are to be mapped during the field season of 1898.

The general administrative work of the Survey and the consideration of the numerous questions that arise from day to day occupied most of the Director's time. As opportunity offered, study of the fossil Brachiopoda of the Cambrian formations was continued during the winter. In the spring attention was given to the preparation of reports on the general subject of the survey of the forest reserves.

After returning from the field Mr. Weeks began the preparation of a card catalogue of names heretofore applied to geologic subdivisions, including bibliographic references and synonymy. In the spring this work was discontinued in order that he might prepare the annual bulletin of the bibliography of geology, paleontology, petrology, and mineralogy for 1897, the manuscript for which has just been completed.

In the office work of the year the Director had the assistance of Dr. W. F. Morsell, stenographer and clerical assistant, and Miss Jean F. Kaighn, confidential clerk.

DIVISION OF PALEONTOLOGY.

As in previous years, several of the paleontologists were engaged in securing paleontologic evidence to assist the geologists in the determination and correlation of the various geologic formations. The work of the paleontologist frequently borders so closely on that of the geologist as to render treatment under a separate head scarcely possible.

Special attention was given during the field season to the study and identification of faunas and floras pertaining to the base of the Coal Measures in Ohio and Michigan; the study of the stratigraphy and associated fauna of the Lower Cretaceous

of Texas; the study of the Eocene, Miocene, and Pleistocene formations and their contained fossils in southern Oregon; and the collection and determination of the stratigraphic position of the flora of the Lower Cretaceous in western and southern Kansas.

Girty party (Paleozoic).—Dr. George H. Girty was occupied during the field season of 1897 in a thorough and systematic examination of the Waverly group. The outcrops of that terrane were followed along the Ohio River and thence northward as far as Columbus. Dr. Girty then visited Huron County, Michigan, where he studied the equivalent strata, in association with Dr. A. C. Lane, of the Michigan survey. Extensive collections of Waverly fossils were made. It is expected that the study of this group will be of assistance in the correlation of the Carboniferous strata, especially in the Appalachian province.

In the office Dr. Girty has been occupied with the study of a number of collections made by the geologists of the Survey. He has rendered valuable assistance to the Director in the preparation of material for a study of the Cambrian Brachiopoda, and has also prepared a paper upon the Carboniferous fresh-water lamellibranchs, together with other minor essays. The remainder of his time has been devoted to the study of the collection of Waverly fossils.

Williams party (Devonian).—Prof. Henry Shaler Williams made an extended reconnaissance in northeastern Maine for the purpose of determining the stratigraphy and collecting associated fossils from the Paleozoic rocks of that region. In Aroostook County 28 townships were traversed. Special attention was given to the examination of Presque Isle, Mapleton, Castle Hill, Ashland, and Sheridan Plantation, on the south of the Aroostook River, and to Caribou, Woodland, Washburn, and New Sweden on the north. In all, 231 localities were examined. The exposures of hard rock are few and generally of small extent, and the rocks themselves have in part been much disturbed and slaty cleavage has developed. The series examined is believed to range from Ordovician to Devonian. The structure and stratigraphic relations could not be fully made out.

In connection with the sedimentary rocks there are frequent outcrops of igneous rocks of various kinds. In connection with rocks which are paleontologically correlated as of the Clinton-Niagara epoch there are evidences of violent volcanic disturbance.

Stanton party (*Cretaceous*).—Mr. Timothy W. Stanton has been engaged, in field and office, in the study of the stratigraphy and associated fauna of the Lower Cretaceous. During the summer of 1897 investigations were carried on in the field in Texas and Kansas. Some collections were made in the immediate neighborhood of Austin, where the State collection, located in the capitol, was carefully studied. Mr. W. F. Cummins's collection at Dallas was carefully examined and field studies were made in the vicinity of Burnet and Travis Peak. The vicinity of Sierra Blanca Junction, in El Paso County, was carefully surveyed, on account of the newly discovered Jurassic beds found by Prof. F. W. Cragin. At Colorado Springs, Colorado, Mr. Stanton studied the Lower Cretaceous types in the museum of Colorado College and in Professor Cragin's private collection. Other collections from the Lower Cretaceous terranes were also examined.

In the office Mr. Stanton continued his monographic discussion of the Lower Cretaceous fossils of the Texas region, and incidentally made reports upon collections submitted to him by members of the Geological Survey. During the year he published A Comparative Study of the Lower Cretaceous Formations and Faunas of the United States, in the Journal of Geology, and An Annotated Catalogue of the Published Writings of Charles A. White, in the Proceedings of the United States National Museum.

Ward party (*Cretaceous*).—In July Prof. Lester F. Ward visited Williamstown, Massachusetts, and there made an examination of a collection of Triassic plant remains from North Carolina, made by the late Dr. Ebenezer Emmons. From Williamstown he went to Block Island and spent a few days collecting a considerable body of fairly well-preserved fossil plants, some of them representing the most characteristic species of the Amboy Clay flora. The period from the middle of September to the middle of October was spent by Professor

Ward in field work in western and southern Kansas, Mr. C. N. Gould accompanying him as scientific field assistant. The object of this work was to continue and, if possible, complete an investigation, begun the previous October, of the Cheyenne formation, which is rich in fossil plants and belongs to the Lower Cretaceous, the formation to which he has been directing especial attention. Operations were begun in the vicinity of Belvidere, in Kiowa County, along the Medicine Lodge River. By the close of September he had completed work in the Belvidere region and made large collections. Then, with a view to tracing the Cheyenne formation in that direction, if possible, he journeyed to the west and south of Belvidere, visiting a number of points. The type localities of Cragin's Big Basin sandstone, on the slope of Mount Nebo, and in the Big Basin itself, were visited and careful studies were made of them. So far as observed, the Cheyenne formation is entirely wanting in this region. Several expeditions were made to the northwest of Ashland, and in one section, on a branch of Little Sandy Creek, the Dakota group was found in good exposures and a considerable collection of fossil plants was made. The line of travel was continued in Kiowa and Ford counties to the extreme upper limit of the Medicine Lodge River, where the contact between the Dakota and the Comanche is exposed. The results of the investigation are of great geologic interest, amounting to nothing less than the discovery of the actual base of the Dakota group and its direct connection with the Comanche series by an uninterrupted transition zone. At Wellington and Winfield, in Cowley County, a search was made for silicified wood from the Permian.

Since returning to Washington Professor Ward has directed his attention for a time to the determination of the fossil plants obtained in the course of his investigation on Block Island, and to work pertaining to the cycads, particularly to the study of the cycadean remains from the Black Hills, and the preparation of material upon that subject for use in connection with the paper which appears in Part II of this Annual Report under the title The Cretaceous Formation of the Black Hills, as indi-

cated by its Fossil Plants. In March, at the invitation of Prof. O. C. Marsh, he visited New Haven and examined what proved to be a very extensive collection of fossil cycads.

From time to time during the year collections have been forwarded for study and description to Prof. William M. Fontaine, at the University of Virginia. Among these are Mr. Diller's large collections from Oregon and some material from the Potomac formation of Maryland. Professor Fontaine has completed during the year the study and determination of the collections sent him in a previous year from the Shasta group of California.

Work on the Compendium of Paleobotany has been considerably delayed during the last year, but in January the obstacles were in part removed, and since then fair progress has been made.

Knowlton party (*Cretaceous*).—Prof. F. H. Knowlton did not take the field during the fiscal year, being engaged in work upon important publications. He completed the manuscript of a volume on the Flora of the Montana Formation. The illustrations for this volume are being drawn, and when they are completed and arranged the final chapter will be written. In January he completed and turned in for publication a Catalogue of the Cretaceous and Tertiary Plants of North America. It is published as Bulletin No. 152 of the Survey series, and contains 247 pages, with nearly 10,000 carefully verified references. At the request of the geologists interested in the Eocene and Miocene formations of the Pacific Coast, Professor Knowlton took up the study of extensive collections of fossil flora from the Puget group. The first representatives of this flora were obtained by Prof. J. S. Newberry, of Columbia University, who did some work upon the specimens before his death, and those collections remain in Columbia University. Through the courtesy of Dr. Arthur Hollick all of this material has been placed at the disposal of the Survey. Professor Knowlton has identified about 75 species, many of which are new, and prepared about 150 pages of manuscript. It is probable that during the coming year he will visit Puget Sound for the purpose of becoming personally familiar with the stratigraphic

position of the flora. Incidentally to his other work he has reported for members of the Geological Survey on the evidences of plants from various horizons, viz, plants from the Miocene lake beds of Idaho, collected by Lindgren; plants from various horizons in California, collected by Turner; Eocene plants from Oregon, collected by Diller; and Lower Cretaceous plants, collected by Ward in South Dakota and Kansas.

Dall party (Tertiary).—The field work undertaken by Mr. W. H. Dall was directed to the study of the Eocene, Miocene, and Pleistocene formations exposed in southern Oregon, in the Roseburg and Coos Bay quadrangles. This work was performed in cooperation with Mr. J. S. Diller, to assist the latter in the discrimination of formations for the mapping of geology. A continuous section 7 miles in length was measured and a series of fossils was collected. This is the most inclusive section of Tertiary formations measured without a break on the Pacific Coast. It extends from the Arago Eocene formation to the Pleistocene. The Eocene is found to consist of two parts, viz, a lower portion, probably equivalent to the Tejon of California, and an upper portion, which may perhaps be correlated with the Puget group of Washington. The existence of a third division, apparently corresponding to the Oligocene, was established, and Miocene fossils equivalent to Conrad's Astoria fossils were collected. In cooperation with the curator of the Lea collection of Eocene fossils in the Academy of Natural Sciences of Philadelphia, Mr. Frank Burns made collections in the Eocene of Mississippi and Alabama. The expense of this work was borne by the Lea collection, and the Survey received one-half of the material.

In the office Mr. Dall's energies have been directed to (1) the registration and cataloguing of the collection of Tertiary fossils; (2) the identification of material sent in; and (3) researches in reference to the Tertiary fossils of Florida and southeastern United States. The registration of fossils, which was largely accomplished during the preceding year, was this year completed, except for certain large lots which had not been separated, and which were laid aside for lack of time to segregate them. Each lot of fossils of a single species from a

single locality has received a number in the registration book, and the locality, horizon, age, collector, and other data with reference to it have been noted. For lack of skilled assistance, the names of the species are not complete in many cases, but during the year 2,700 species, chiefly Oligocene and Miocene, have been fully named. The number of registrations during the year is 1,122, including about 6,650 specimens. The material sent in for identification by members of the Survey included about 3,500 specimens. The study of the Tertiary fossils of Florida and southeastern United States consists in a revision of the classification and nomenclature and the naming of new species. The revision covers 2,728 names. In cooperation with the Wagner Institute of Science of Philadelphia, there has been published Part IV of this revision, consisting of 377 pages quarto and 13 plates. It is anticipated that the completion of one more volume will finish this work. In 1895 a Table of the North American Tertiary Horizons was prepared, which appears in Part II of the Eighteenth Annual Report. It shows the equivalence of the named horizons, so far as known, on the Atlantic and Gulf coasts, in the Great Basin of the interior, and on the Pacific coast, together with the most nearly analogous European horizons, and references to the literature.

Marsh party (*vertebrate paleontology*).—Prof. O. C. Marsh prepared for publication a paper on the Principal Characters of the Protoceratiidæ, a group of Miocene mammals among the most important yet discovered in that formation, marking a definite geologic horizon. This article, with the Director's consent, appeared in the American Journal of Science for September, 1897. He also attended the International Geological Congress in Russia, and during his sojourn in Europe visited a number of museums containing vertebrate fossils. A paper containing part of the results, entitled Recent Observations on European Dinosaurs, was published, with the Director's permission, in the American Journal of Science for December. The European fossils examined had a direct bearing upon the age of certain formations on our Atlantic coast, which, on the evidence of vertebrate paleontology, are correlated as Jurassic. This evidence was presented by Professor Marsh in a paper

read before the National Academy of Sciences at Boston in November.

In extending his researches into the paleontologic horizons which may be established in the West, Professor Marsh has endeavored during the last year to obtain further evidence in regard to the Atlantosaurus and Baptanodon beds. Each of these is marked by a special vertebrate fauna so different from the others that the strata can be readily identified by abundant fossils. Special effort has been made to secure other fossils, both in vertebrates and plants, which might be distinctive enough to be used as supplementary evidence. This investigation was conducted in the Black Hills, with reference both to the two Jurassic horizons above named and to the next higher strata. The most important characteristic fossils here were cycads. These were found to mark a definite horizon above the known Jurassic deposits, but apparently in that formation and not in the Cretaceous. Work on the monographs and memoirs in course of preparation has been continued during the year and fair progress has been made, especially in investigation and illustration.

DIVISION OF CHEMISTRY.

During the fiscal year 1897–98 the work of the Division of Chemistry was continued under the charge of Prof. F. W. Clarke, who was assisted by Dr. W. F. Hillebrand, Dr. H. N. Stokes, and Mr. George Steiger. During the winter months, from December 10, 1897, to March 10, 1898, Mr. Steiger carried on his work in the laboratory of Stetson University, Florida, and Mr. William Valentine, of New Haven, was employed as a temporary aid in the laboratory in Washington. From July to November Professor Clarke was absent from Washington much of the time, in charge of the exhibits of the Department of the Interior at the Tennessee Centennial Exposition in Nashville. During May, also, he was absent on similar duty at the Trans-Mississippi Exposition in Omaha.

Throughout the year all requests for analyses, before being sent to the laboratory, have been referred to a committee for consideration. The effect of this policy has been to reduce the number of routine analyses made, and incidentally to

increase the opportunities of the chemists for original investigation. The total number of analyses reported was 168, a smaller number than usual, but representing a better and more carefully chosen grade of material. Among the samples analyzed were 15 rocks from California, 5 from Maryland, 5 from Colorado and New Mexico, 16 from the Tintic district, Utah, 16 from the Southern Appalachians, 15 from Michigan, and 7 from the Adirondacks. There were also 7 iron ores from the Adirondacks and 5 mine waters from Butte, Montana, together with 6 coals from the Indian Territory and 23 from the Coos Bay field in Oregon. The coal work was carried out with especial care; it included some investigation as to methods, and was so done as to fit in with the researches being made by a special committee on coal analysis appointed by the American Chemical Society, of which committee Dr. Hillebrand is a member.

In original research Dr. Hillebrand has worked out new methods for the quantitative determination of chromium and vanadium in rock analysis, and has studied the occurrence of vanadium in rocks generally. This metal, commonly supposed to be rare, is now found to be most widely distributed; and the examination of about 70 rocks has proved it to be almost universally present in weighable quantities. It appears to be chiefly in the dark silicates, for it occurs in largest amount in the so-called basic rocks, and is least in such rocks as the granites and rhyolites.

Last year Dr. Stokes announced his important research upon the chloronitrides of phosphorus. This year he has extended that investigation by a study of the phosphimic acids derived from the higher members of the former series. His work is an important contribution to a new field in inorganic chemistry.

DIVISION OF HYDROGRAPHY.

This division was continued in charge of Mr. Frederick H. Newell, whose assistants in the various subdivisions of investigations were Messrs. Arthur P. Davis, hydrographer in charge of stream measurements; Willard D. Johnson, hydrographer for the Great Plains area; N. H. Darton, geologist in investigation of underground waters; Cyrus C. Babb, assistant

hydrographer inspecting field work; and Edwin G. Paul, assistant hydrographer in charge of instruments and equipments. In addition there have been employed in the field a number of specialists, whose names are mentioned below in connection with the work in various localities.

Field work has been carried on in a manner similar to that outlined in the Eighteenth Annual Report, the area under investigation being extended as rapidly as accuracy of results would admit. In the allotment of funds the work of stream measurement has received the largest share—over one-half of the total. Of the remainder, more than one-half has been devoted to the investigation of underground waters and artesian wells, and the balance to the preparation of reports on the best methods of utilizing the water supply. The results are shown in the accompanying volume on hydrography (Part IV), and in the series of Water-Supply and Irrigation Papers, sixteen of which have now been published. The following description of field work carried on in various parts of the country is arranged as in previous years, in a general geographic order, taking first the humid region, or eastern half of the United States; next the subhumid region, which is somewhat arbitrarily assumed to include the States from North Dakota to Texas; and finally the arid region, embracing the greater part of the Western States and Territories.

HUMID REGION.

New England.—A study of the hydrographic data for the rivers of New England has been continued by Prof. Dwight Porter, his paper being included in the volume on hydrography (Part IV), as the first portion of the paper on stream measurements.

New York and Pennsylvania.—Additional hydrographic data concerning the rivers of these States have been obtained through cooperation with various engineers and by the gradual extension of river stations northward, particularly on the Delaware and Susquehanna rivers.

Maryland.—In this State effective assistance has been rendered by Prof. W. B. Clark, State geologist, in the maintenance of river stations. Reconnaissance work has been carried on

particularly along the Potomac River and some of its northern tributaries, results of which are shown in Senate document No. 90, 55th Congress, 2d session.

Virginia and West Virginia.—The work previously outlined has been continued by Prof. D. C. Humphreys, of Lexington, Virginia.

North and South Carolina.—The river stations in these States have been maintained and extended by the assistance of Prof. J. A. Holmes, State geologist, the field work being mainly performed by Mr. E. W. Myers.

Georgia, Alabama, and Tennessee.—In these extreme southeastern States the operations have been continued under the direction of Prof. B. M. Hall, of Atlanta. Through his activity the number of stations has been considerably increased and a notable amount of hydrographic data has been brought together. Data concerning deep wells in Alabama are being assembled by Prof. Eugene A. Smith, State geologist.

Michigan.—A report on the deep wells on the Lower Peninsula of Michigan is being prepared by Prof. Alfred C. Lane, assistant State geologist.

Mississippi Valley.—For the larger rivers of the Mississippi Valley, facts of interest are being obtained by the Corps of Engineers, United States Army. Through the courtesy of various officers these facts have been placed at the disposal of this Survey, and in some cases additional data have been acquired through occasional field work or computation.

SUBHUMID REGION.

North Dakota.—In this State Prof. Earle J. Babcock, of Grand Forks, has continued his reconnaissance southeasterly from the Devils Lake region.

South Dakota.—Mr. N. H Darton, geologist, has pushed his field work from areas in Nebraska northerly into contiguous portions of South Dakota, with the intention of making a thorough study of the artesian conditions as revealed by the structure to the east and south of the Black Hills.

Nebraska.—In this State, as in the preceding, Mr. Darton has continued to devote his time to a carefully conducted reconnaissance of the conditions affecting the distribution of

underground waters. He has, in particular, studied the area in the western end of the State, the results being shown in his paper in the accompanying volume on hydrography (Part IV).

Prof. Erwin H. Barbour, acting State geologist, has continued his cooperation, both in field work and in the general study of methods of utilizing the well waters of the State.

The river measurements have been carried on under the direction of Prof. O. V. P. Stout, a particular study of the North and South Platte rivers being made at their junction by Mr. Charles P. Ross.

Kansas.—The principal stream measurements in this State have been under the charge of Mr. W. J. Russell. In addition a general reconnaissance of some of the streams in the southeastern part of the State has been made by Prof. E. C. Murphy, who has also maintained several river stations accessible from Lawrence. Professor Murphy has also continued his investigation of methods of raising water by means of windmills, and Prof. O. P. Hood, of Manhattan, has obtained results along related lines.

Mr. Willard D. Johnson has continued his examination of the water supply of the high plains, having made his headquarters for a portion of the year at Meade, Kansas.

Texas.—Stream measurements have been carried on by Prof. Thomas U. Taylor, of Austin, and the results of his investigation of the silting of Lake McDonald have been arranged for publication. The paper on irrigation in this State, by Mr. William Ferguson Hutson, has been printed as Water-Supply and Irrigation Paper No. 13.

ARID REGION.

The greater part of the funds has been expended within the arid region, where the United States is the great landowner. The principal work has been maintenance of measurements of the discharge of important streams at places noted in the preceding report, in order to obtain data showing the fluctuation in volume of these streams from month to month and year to year. Reservoir surveys have also been made to a small extent, and data bearing upon the possibilities of future reclamation of the dry though fertile lands have been accumulated.

Arizona.—Measurements of discharge of Salt and Verde rivers have been continued by Mr. W. A. Farish, and of the Gila River by Mr. Albert T. Colton.

California.—Mr. J. B. Lippincott, of Los Angeles, has continued his active field work and measurement of streams, mainly in the arid portion of the State, and has also continued a reconnaissance of the irrigated area in southern California.

Colorado.—Cooperation has been continued with the State engineer's office at Denver, Mr. A. L. Fellows taking the place of Mr. F. Cogswell.

Idaho.—Continued assistance has been rendered by Mr. F. J. Mills, State engineer, and measurements of Bruneau River have been continued by Mr. Andrew J. Wiley, of Grand View.

Montana.—Mr. S. M. Emery, of Bozeman, has given personal attention to the investigations in this State, and has begun the preparation of a paper upon Irrigation Development. In this he has been assisted by Mr. Roe Emery.

Nevada.—Mr. L. H. Taylor, of Golconda, has maintained the river stations as in previous years.

New Mexico.—The various river stations along the Rio Grande have been under charge of Mr. P. E. Harroun, of Albuquerque, with the exception of the locality at El Paso, which has been placed in charge of Mr. W. W. Follett, engineer of the Mexican Boundary Commission.

Oregon.—Investigations in this State have been carried on in connection with those on the east, in Idaho, and on the north, in Washington. Mr. Cyrus C. Babb made a reconnaissance along the Deschutes River and obtained hydrographic data concerning streams east of the Cascade Range.

Utah.—The work in this State has been continued by Mr. Samuel Fortier, of Corinne, who has also brought together data concerning the flow of water in various canals. Observations of the fluctuations of Utah Lake have also been begun.

Washington.—Mr. Sydney Arnold, of North Yakima, has had charge of stream measurements east of the Cascade Range, and a considerable amount of hydrographic data has been obtained by Mr. A. Judson Adams, of Port Angeles, concerning the streams of the Olympic Range.

Wyoming.—The river stations in this State have been maintained by Mr. Clarence T. Johnston.

RESULTS.

An attempt is made to publish results obtained during each calendar year as soon as possible after the close of the field work, so as to place the facts before the public at the earliest possible date. In order to accomplish this, two series of publications are made use of. One of these consists of what are known as the Water-Supply and Irrigation Papers, each limited to 100 pages in length and to an edition of 5,000 copies. In these the operations at river stations during 1897 have been published as papers Nos. 15 and 16. In No. 12 is given the report by Mr. N. H. Darton on southeastern Nebraska; in No. 13, a statement concerning irrigation in Texas; and in No. 14 a discussion of tests of pumps for irrigation. There have also been accumulated a considerable number of other papers awaiting publication.

The other series of publications on hydrography consists of the annual volume accompanying the report of the Director. These, being printed in larger edition and offering better facilities for illustration, are made to include the more detailed papers accompanied by larger maps and diagrams. Thus, while Water-Supply Papers Nos. 15 and 16 give in condensed form the numerical results of individual river measurements, the larger paper, in the annual volume on hydrography (Part IV), gives the results of computations of daily discharge, shown in diagrammatic form, and the maximum, minimum, and monthly means resulting from a careful study of all the available data.

DIVISION OF MINERAL RESOURCES.

The work of the Division of Mineral Resources, under the charge of Dr. David T. Day, consisted mainly of the correspondence necessary to the gathering and compilation of the statistical data for the calendar year 1897 and of the preparation of a report embodying those data, which is published as Part VI of this Annual Report. Considerable time was also

given to the preparation of replies to many demands for technical information in regard to the conditions of occurrence and the uses of various minerals found in the United States.

In addition to the various special agents who have aided in this work, Dr. Day has been assisted by Mr. E. W. Parker, statistician; Mr. Jefferson Middleton, clerk; Mr. Theodore H. Johnson, Mr. Griffith Thornton, Miss Belle Worth Bagley, Miss Altha T. Coons, Miss Julia M. Corse, and Miss Agnes Gerry, statistical experts, and Mrs. Florence Pollock, copyist.

The earlier part of the fiscal year was devoted largely to the reading of proof and the distribution of the report, Mineral Resources of the United States, 1896.

The following chapters have already been submitted to the printer for publication as advance extras from Mineral Resources of the United States, 1897, in accordance with law: Precious Stones, Abrasive Materials, Asbestos and Graphite, Asphaltum, Mineral Paints, Fluorspar and Mica, Stone, Sulphur and Pyrites, Soapstone, Salt, Gypsum, Antimony, The Kaolins and Fire Clays of Europe and the Clay-working Industry of the United States, Coal.

A considerable portion of Dr. Day's time the latter part of the year was devoted to the organization of the Mines and Mining Department at the Trans-Mississippi and International Exposition.

The total value of the mineral products of the United States in 1897 again failed to make the normal increase of $25,000,000, but increased only about one-third of this amount, or $8,572,127. This gave a grand total of $632,309,565, the greatest in the history of the country. A noticeable feature of this remarkable total is the increase in the value of almost all the important metallic products, especially that of pig iron, gold, copper, lead, and zinc, each of the three latter metals reaching their greatest production. Proportionately aluminum made the largest increase, its product being over three times that of 1896 and many times greater than in any year prior to 1895. The metallic products made a gain over 1896 of $14,601,596, whereas the nonmetallic products fell off $6,029,467. The principal contributors to this decrease in value were petroleum

and anthracite coal. On the other hand, bituminous coal, stone, natural gas, cement, and salt made notable advances in value.

The principal factors in this total are given in detail below.

METALS.

Iron and steel.—The year 1897 proved to be a record breaker in the production of pig iron, 9,652,680 long tons being produced, as compared with 8,623,127 tons in 1896, an increase of 1,029,553 tons, or 11.94 per cent; and 9,446,308 tons in 1895, an increase of 206,372 tons, or 2.18 per cent. While the quantity of pig iron made in 1897 exceeded that of any previous year, the value was $95,122,299, or $10,076,251 less than the somewhat smaller product of 1895, when the total value was $105,198,550. In 1896 the value of the product was $90,250,000. The average price per ton has steadily declined in the last three years—from $11.14 in 1895 to $10.47 in 1896, and $9.85 in 1897. Bessemer steel ingots increased from 3,919,906 long tons in 1896 to 5,475,315 tons in 1897, a gain of 1,555,409 tons, or 39.68 per cent. The production of open-hearth steel ingots and castings increased from 1,298,700 tons in 1896, to 1,631,843 tons in 1897, an increase of 333,143 tons, or 25.65 per cent. The value of all Bessemer steel in the form of rails and billets in 1897 was $77,050,000; that of open-hearth steel in the form of billets was $24,275,000.

Iron ores.—The value of the iron ores produced in the United States in 1897 was $18,953,221, as compared with $22,788,069 in 1896. Although there was this considerable decrease in the value of the iron-ore product, the quantity increased from 16,005,449 long tons in 1896, to 17,518,046 long tons in 1897. The average price per ton in 1896 was $1.42, as compared with $1.09 in 1897.

Gold.—The gold product continued to increase, and in 1897 was valued at $57,363,000, as compared with $53,088,000 in 1896.

Silver.—The coining value of the silver product in 1897 was $69,637,172, or a commercial value of $32,316,000. In 1896

the coining value of the silver product was $76,069,236, or a commercial value of $39,655,000. This is a decrease in 1897 of $6,432,064 in the coining value and of $7,339,000 in the commercial value.

Copper.—The copper industry continues to be in a flourishing condition. The product in 1897 was 491,638,000 pounds, or 245,819 tons, valued at $54,080,180, the greatest product ever obtained in the United States. In 1896 the product was 460,061,430 pounds, valued at $49,456,603. The average price per pound in 1896 was 10.5 cents, in 1897 it was 11 cents.

Lead.—The lead product also increased from 188,000 short tons in 1896 to 208,192 tons in 1897, which is the largest product ever attained in this country. The value also increased from $10,528,000 in 1896 to $14,885,728 in 1897.

Zinc.—This product also contributed to the general increase in value of the metallic products of the United States in 1897. In 1896 the product was 81,499 short tons, valued at $6,519,920; in 1897 it was 99,980 tons, valued at $8,498,300.

Quicksilver.—The product declined from 30,765 flasks in 1896, worth $1,075,449, to 26,648 flasks in 1897, worth $993,445. The industry is confined practically to California. The Texas deposit is still undeveloped.

Aluminum.—The product of aluminum and the variety of its uses continue to increase. In 1896 the product was 1,300,000 pounds; in 1897 it increased over threefold, or to 4,000,000 pounds. The value increased from $520,000 in 1896 to $1,500,000 in 1897.

Nickel.—The product of the United States continues to be derived as a by-product, and, while small, showed a slight increase in 1897. In 1896 the product was 17,170 pounds, worth $4,464; in 1897 it was 23,707 pounds, valued at $7,823. The Canadian mines continue to furnish the principal supply.

Platinum.—The product was 150 ounces, worth $900, in 1897, as compared with 163 ounces in 1896, valued at $944.

Manganese ore.—The product of manganese increased slightly, or from 10,088 long tons in 1896, valued at $90,927, to 11,108 tons in 1897, worth $95,505.

Antimony.—The total amount of metallic antimony produced in 1897 was 756 short tons, having a value of $109,655, as compared with 601 short tons in 1896, worth $84,290. A large portion of the product was from foreign ores smelted in New Jersey. The amount of antimony ore, or stibnite, mined in the United States during the year was 489 short tons, valued at $8,864.

FUELS.

Coal.—The total product of coal in 1897 amounted to 178,769,344 long tons, equivalent to 200,221,665 short tons, as compared with 171,416,390 long tons, or 191,986,357 short tons, in 1896. The production in 1897 was the largest ever attained, the product last year in short tons exceeding 200,000,000 for the first time in our history. The production of anthracite coal in Pennsylvania showed a decrease of 1,709,213 long tons as compared with 1896, and of 4,971,048 long tons as compared with the product in 1895, which was the year of maximum production for anthracite coal. It follows, therefore, that the entire increase in the total production of coal in 1897 was in the output of bituminous coal, which increased from 122,893,104 long tons, or 137,640,276 short tons, in 1896, to 131,955,270 long tons, or 147,789,902 short tons, in 1897. The increase in the bituminous product was, therefore, 9,062,074 long tons, or 10,149,626 short tons, and made a net increase in the product of coals in 1897 of 7,352,954 long tons, or 8,235,308 short tons. The net increase in the value of the product in 1897 as compared with 1896 was $2,229,012, the difference being an increase of $4,848,537 in the value of the bituminous product and a decrease of $2,619,525 in the value of the anthracite product. The total value of the product obtained in 1897 was $198,869,178, against a total value in 1896 of $196,640,166. This was divided as follows: Anthracite value in 1897, $79,129,126; in 1896, $81,748,651; bituminous value in 1897, $119,740,052; in 1896, $114,891,515. The product of bituminous coal in all cases includes a small amount of anthracite coal produced in Colorado and New Mexico; also semianthracite mined in Arkansas and Virginia, the lignite coals of Colorado, North

Dakota, California, Oregon, and Texas, and semibituminous, cannel, splint, and block coals.

A study of the conditions which affected the coal-mining industry in 1897 reveals the fact that the higher prices of anthracite coal which prevailed during the last two years, and which have been due to a cooperation among the producers for the purpose of restricting production and maintaining prices, have resulted in the adoption by large consumers of other kinds of fuel. Bituminous coal is, with the use of smoke-consuming furnaces, superseding anthracite coal for steam raising. Iron furnaces formerly using anthracite coal, or a mixture of anthracite coal and coke, are substituting coke or a mixture of bituminous coal and coke, and the use in kitchen ranges and household furnaces of prepared sizes of coke is increasing. The use of gas for domestic purposes, particularly in summer, is also increasing. Anthracite producers in 1897 were successful in maintaining prices, the average per ton for the year being $1.85, which was the same as that which obtained during 1896. The price of bituminous coal, on the other hand, was somewhat lower, and continues an uninterrupted succession of lower annual prices since 1887. The average price for all coals included in the bituminous product was 81 cents in 1897, against 83 cents in 1896 and $1.12 in 1887. In arriving at the average price of anthracite coal, only the marketed product is considered. The amount consumed at the collieries, which consists usually of culm or slack and otherwise wasted product, is excluded from the value. The value of the bituminous coal includes all sizes, for, while the colliery consumption usually consists of slack coal, it has a market value.

Coke.—Stimulated by a year of exceptional activity in the iron and steel industries of the United States, the production of coke increased from 11,788,773 short tons in 1896 to 13,288,984 short tons in 1897. While this was an increase of a little over 1,500,000 tons as compared with 1896, it was about 45,000 tons less than the product in 1895, which was, in coke production as in the production of anthracite coal, the year of maximum output. The value of the coke product in 1897

was only $440,000 more than that of 1896, the proportionately higher value in the former year being due to higher prices set by the larger producers of Connellsville coke. Early in the year the large concerns in the Connellsville region put the prices of their product at $2 per ton for furnace, $2.30 for foundry, and $2.35 for crushed, and maintained these prices throughout the year. The average price per ton realized for the entire coke product of 1896 was $1.837; in 1897 the average price per ton was $1.663.

Petroleum.—The product decreased slightly, from 60,960,361 barrels of 42 gallons each in 1896 to 60,568,081 barrels in 1897. The remarkable feature of the petroleum industry throughout the year was the break in prices, resulting in a decrease in the total value from $58,518,709 to $40,929,611, a loss of practically 30 per cent.

Natural gas.—The product of natural gas continued to decrease, but the higher prices set by producers for their product caused the total value in 1897 to show a slight increase over the total value in 1896, the figures for the two years being, respectively, $13,006,650 and $13,826,422.

STRUCTURAL MATERIALS.

Stone.—The total value of stone of all kinds increased from $31,346,171 in 1896 to $36,070,651 in 1897. The export of slate continued to be one of the leading features of the trade, notwithstanding the settlement of the strikes in the slate-quarrying region of Wales. The continued increased demand for the more highly finished products of the stone quarries remained a feature of the year.

Clays.—There was a slight decline in the general volume of the clay industry. In 1896 the value of the brick clays aggregated about $9,000,000 in the crude state, and that of other clays $800,000. In 1897 the brick clays were valued, in the crude state, at about $8,000,000, and all other clays at about $1,000,000. The total value of wares made from clay in 1897 was $60,911,641; in 1896 it was $62,528,963

Cement.—Natural-rock cement continued to increase. In 1896 the product was 7,970,450 barrels (of 300 pounds each),

worth $4,049,202; in 1897 it was 8,311,688 barrels, worth $3,862,392. It will be noted that in spite of the increased output the value declined slightly. The increase in the Portland-cement product was much more marked—from 1,543,023 barrels in 1896, worth $2,424,011, to 2,677,775 barrels, worth $4,315,891, in 1897. The number of Portland-cement works increased from 26 to 29.

ABRASIVE MATERIALS.

Millstones.—The value of the product in 1897 showed a slight increase over that of 1896, and, although amounting altogether to only $25,932, was the largest value reported since 1889. The value of millstones produced in 1896 amounted to $22,567, indicating an increase in 1897 of $3,365. Millstones of domestic production are used chiefly for grinding paint ores, cement rock, and the coarser cereals. Their use in flouring mills has been superseded by the roller process.

Grindstones.—The product was the largest in any year since 1891, being valued at $368,058, an increase of $41,232 over the value of the product in 1896, and exceeding the value of grindstones produced in 1895 by over 75 per cent.

Corundum and emery.—The production of corundum and emery has shown very little change in the last three years, the quantity mined in 1897 amounting to 2,165 short tons, against 2,120 short tons in 1896 and 2,102 short tons in 1895. The value of the product in 1897 was $106,574, a decrease from 1896 of $6,672, and an increase compared with 1895 of $318.

Oilstones.—The value of this class of abrasives produced in the United States in 1897 was $149,970, against a value of $127,098 in 1896. The production is practically controlled by one concern.

Infusorial earth.—Including the product of tripoli from Virginia, the output of infusorial earth in 1897 was 3,833 short tons, valued at $22,385, against 3,846 short tons, valued at $26,792, in 1896.

Garnet.—Abrasive garnet produced in the United States in 1897 amounted to 2,554 short tons, valued at $80,853, a slight

decrease in quantity and an increase in value as compared with 1896.

Pumice stone.—A commercial product of this material is reported for the first time in 1897, the total output amounting to 158 tons, which was shipped to Chicago for preparation for market.

CHEMICAL MATERIALS.

Phosphate rock.—The development of phosphate-rock mines in Tennessee was active during 1897, and the product from that State amounted to 128,723 long tons. Florida produced 552,342 long tons, and South Carolina 267,380 long tons of land rock and 90,900 long tons of river rock. The total product for the United States amounted to 1,039,345 long tons, an increase of nearly 100,000 tons over the product of 1896, but less than 1,000 tons in excess of the product in 1895. Prices continue to decline, the value of the product in 1897 being $2,673,202, against a value of $2,803,372 for the smaller product in 1896.

Gypsum.—The product of crude gypsum in 1897 amounted to 288,982 short tons, as compared with 224,254 short tons in 1896. The product in 1897 was the largest on record, and that in 1896 was the smallest in six years. Taking the value of the material in the condition in which it was first sold, the product in 1897 was worth $755,864, an increase of $182,520 over 1896, but less than the value in 1894 and in 1895.

Salt.—The production of salt in 1897 was phenomenally large, amounting to 15,973,202 barrels of 280 pounds, as compared with 13,850,726 barrels in 1896. The value of the product increased $879,181—from $4,040,839 in 1896 to $4,920,020 in 1897. The average price per barrel received by producers, exclusive of the cost of package, in both years was 30 cents, a fraction over 10 cents for 100 pounds. An agreement was effected among the producers in Michigan to uphold prices, with the result that the average for the State advanced from 22.7 cents in 1896 to 31.4 cents in 1897, but this was not sufficient to effect an increase in the average price for the entire salt product.

Bromine.—The industry continues in the hands of the sales syndicate, the product in 1897 being 487,149 pounds, with a

value at the works of $129,094, a decrease from the product of 546,580 pounds, valued at $144,501, in 1896. This product includes the bromine in potassium bromide made directly.

Sulphur.—The product decreased in 1897, owing to the works in Louisiana being shut down the greater part of the year. The total output in 1897 was 2,275 short tons, only 43 per cent of the amount produced in 1896, when the product amounted to 5,260 short tons. The value declined from $87,200 in 1896 to $45,590 in 1897.

Pyrites.—The substitution of pyrites for sulphur in the manufacture of sulphuric acid is on the increase. The production of iron pyrites for acid manufacture in 1897 amounted to 143,201 long tons, against 115,483 tons in 1896, making the largest output ever recorded. The value advanced from $320,163 in 1896 to $391,541 in 1897.

Borax.—The product in 1897 amounted to 16,000,000 pounds, valued at $1,080,000, an increase from 13,508,000 pounds, worth $675,400, in 1896.

Fluorspar.—The product shows a decrease from 6,500 short tons, valued at $52,000, in 1896, to 5,062 short tons, valued at $37,159, in 1897.

PIGMENTS.

Metallic paint.—The product, exclusive of mortar colors, increased from 14,805 short tons, valued at $180,134, in 1896 to 16,699 short tons, valued at $187,694, in 1897. The production of mortar colors decreased from 9,660 in 1896 to 8,237 short tons in 1897.

Ocher, umber, and sienna.—The production of ocher decreased slightly, from 14,074 short tons in 1896 to 14,006 short tons in 1897. The value increased from $136,458 to $162,764. The production of umber increased from 165 to 480 short tons, and the production of sienna from 395 to 620 short tons, with proportionate increase in value.

Venetian red.—The production in 1897 was more than three times that of 1896, the phenomenal increase being due to the bringing in of a large product from Illinois, which is reported as a source of supply for the first time in 1897.

Zinc white.—The use of zinc white as a base for white and color pigments is increasing, the production in 1897 amounting

to 25,000 short tons, worth $1,750,000, an increase of 25 per cent over 1896. Prices remained steady.

Barytes.—The production in 1897 increased a little more than 50 per cent over that of 1896, amounting to 26,042 short tons, against 17,068 short tons the previous year. The value increased 25 per cent—from $46,513 to $58,295.

Cobalt oxide.—The product increased from 10,700 pounds, worth $15,301, in 1896 to 19,520, worth $31,232, in 1897.

MISCELLANEOUS.

Fuller's earth.—This product continues to come practically entirely from Florida, the beds in Georgia noted in the last report having not yet been developed. The product in 1897 was 17,113 short tons, valued at $112,272, as compared with 9,872 short tons in 1896, worth $59,360.

Precious stones.—The product increased 33.54 per cent, or from $97,850 in 1896 to $130,675 in 1897. The principal features of the year were the increased output of sapphires from Montana, the development of turquoise deposits in New Mexico, Arizona, California, and Nevada, and the finding of large quantities of gigantic quartz crystals at Mokelumne Hill, California. The importation of diamonds also increased markedly upon the reduction of the import duties.

Mica.—The amount of sheet mica produced in 1897 exceeded that of any year since 1885, aggregating 82,676 pounds. To this should be added 740 tons of scrap mica, ground for manufacture into lubricants, wall papers, boiler covering, etc. The value of the sheet mica produced in 1897 was $80,774, and that of the scrap mica $14,452, a total of $95,226. In 1896 the value of the scrap mica was $1,750 and of sheet mica $65,441, a total of $67,191.

Feldspar.—The product increased from 9,114 long tons in 1896, worth $35,200, to 11,175 tons in 1897, worth $43,100.

Flint.—This is chiefly quartz, ground for potters' use. The product increased from 11,124 long tons in 1896, valued at $24,226, to 11,952 tons in 1897, valued at $26,227.

Asphaltum.—The product in 1897 amounted to 75,945 short tons, valued at $664,632, against 80,503 short tons in 1896,

worth $577,563. It will be noted by this that while the output in 1897 decreased 4,558 tons, the value not only showed a marked increase ($87,069), but reached the highest figure ever recorded.

Asbestos.—The product showed a slight increase, from 504 short tons in 1896, valued at $6,100, to 580 tons in 1897, valued at $6,450. The Canadian deposits continue to supply by far the larger part of this material used in the United States.

Magnesite.—This product comes entirely from California. It was 1,143 short tons in 1897, worth $13,671. In 1896 the product was 1,500 tons, worth $11,000.

Graphite.—The production during 1897 amounted to 1,254,402 pounds of crystalline and refined plumbago, and 1,108 short tons of amorphous graphite and graphitic coal. The value of these products was respectively $43,099 and $11,178. In 1896 the product of crystalline plumbago was 535,858 pounds, and of the amorphous variety 760 short tons. The total value of both these varieties in 1896 was $48,460.

Soapstone.—In 1897 the product was 21,923 short tons, worth $365,629, against 22,183 tons in 1896, valued at $354,065. The product of fibrous talc increased from 46,089 short tons in 1896, valued at $399,443, to 57,009 short tons in 1897, worth $396,936.

Mineral waters.—The quantity of mineral waters sold continued to decline, there being 23,255,911 gallons sold in 1897 and 25,795,312 gallons in 1896. Nevertheless, the value of the product increased from $4,136,192 in 1896 to $4,599,106 in 1897.

Limestone for iron flux.—This product gained slightly, or from 4,120,102 long tons in 1896, valued at $2,060,000, to 4,247,688 long tons in 1897, worth $2,124,000.

Bauxite.—The product increased slightly, from 18,364 long tons in 1896, worth $47,338, to 20,590 long tons in 1897, valued at $57,652.

TOPOGRAPHIC BRANCH.

The general organization of the Topographic Branch has remained practically unchanged. With reference to the character of the work, there are two divisions, namely, a Division

of Triangulation, under which falls everything relating to the control for the topographic mapping—that is, the furnishing of initial points, including astronomic location, base-line measurement, triangulation, and primary traverse; and a Division of Topography, to which belong all the details pertaining to the preparation of the topographic map of the United States other than those mentioned above, including spirit leveling.

For the purpose of administration, there have been throughout the year five sections:

Atlantic section, under Mr. H. M. Wilson;

Central section, under Mr. John H. Renshawe;

Rocky Mountain section, under Mr. E. M. Douglas;

Pacific section, under Mr. R. U. Goode;

Indian Territory section, under Mr. C. H. Fitch.

The duties imposed upon the Topographic Branch were largely increased in consequence of legislation placing the survey of the forest reserves and the survey of the boundary line between Idaho and Montana under the supervision of the Director of the Geological Survey, and on account of an increased appropriation for Alaska.

The topographic corps was increased by the addition of five assistant topographers, through certification by the Civil Service Commission, as follows: A. H. Sylvester, Arthur Stiles, E. C. Bebb, Glenn S. Smith, and F. E. Matthes.

Cooperative agreements were arranged with two States, New York and Maryland, $15,000 having been appropriated by the former and $1,000 by the latter.

The act making provision for the survey of the forest reserves, approved June 4, 1897, has been quoted in an earlier part of this report (see pages 15–18). The surveys in the forest reserves made necessary by this law included topographic mapping and the execution of subdivisional surveys under the rectangular system. The purposes of these surveys were, as defined under instructions approved by the Secretary of the Interior—

> The preparing of topographic maps upon the scale of 2 miles to the inch, with contour intervals of 100 feet, to serve as base maps for the representation of forestry details, agricultural and mineral lands, etc.; the establishment of bench marks,

indicating elevation above sea level; the subdivision of the reserves, by running township lines (unless this has heretofore been done by the General Land Office), for the purpose of designating tracts of land; the demarcation, by means of section lines, of tracts which are more valuable for agriculture and minerals than for their timber, it being understood that the land-subdivision surveys shall be limited to township exteriors, except in cases where more than the area of one-fourth of a township is taken up by agricultural or mineral lands or by settlements, in which latter event the township shall be subdivided into sections over such portions as include agricultural or mineral lands or settlements; while the ultimate decision regarding the status of such lands rests with the Secretary of the Interior, tentative decisions, for the purpose of deciding whether or not such tracts should be surveyed, shall be made by the chief of party; the mapping by the topographer in charge of each party of the outline of all wooded and forest areas.

The surveys relating to the Black Hills, Bighorn, Teton, Uinta, Lewis and Clarke, and Flathead reserves were assigned to the Rocky Mountain section, and those relating to the Bitterroot, Priest River, Washington, San Bernardino, San Gabriel, and San Jacinto reserves were assigned to the Pacific section.

The law relating to the Idaho and Montana boundary line is as follows:

For surveying that portion of the boundary line between Idaho and Montana beginning at the intersection of the thirty-ninth meridian, with a boundary line between the United States and the British Possessions, including the retracing of so much of the international boundary line as may be found necessary for the determination of said intersection, then following said meridian south until it reaches the summit of the Bitter Root Mountains, and for locating points on said meridian by triangulation from the Spokane base of the United States Geological Survey, and on the continuation of said boundary line along the Bitter Root Mountains between Idaho and Montana, seven thousand six hundred and fifty dollars, or so much thereof as may be necessary, to be immediately available: *Provided*, That the Secretary of the Interior shall direct that the survey shall be executed under the supervision of the Director of the Geological Survey by such persons as may be employed by or under him for that purpose, and such survey shall be executed under instructions to be issued by the Secretary of the Interior: *Provided further*, That the plats and field notes thereof prepared shall be approved and certified to by the Director of the Geological Survey, and three copies thereof shall be returned, one for filing in the surveyor-general's office of Idaho, one in the surveyor-general's office of Montana, and the original in the General Land Office.

And such surveys, field notes, and plats shall have the same legal force and effect as heretofore given to the acts of surveyors-general: *Provided further*, That all laws inconsistent with the provisions hereof are declared to be inoperative as respects such survey. (Sundry civil act approved June 4, 1897.)

The work connected with the locating and marking of this boundary line was placed under the supervision of Mr. R. U. Goode.

On May 18, 1897, Mr. S. S. Gannett, topographer, by order of the Secretary of the Interior, at the request of the Commis-

sioner of Indian Affairs, was detailed to determine an astronomic station in the vicinity of Lumberton, New Mexico, and to mark a point on the one hundred and seventh meridian of longitude at its intersection with the south line of the State of Colorado, this being the southeast corner of the Southern Ute Indian Reservation. This work was completed July 2, the entire cost being borne by the Indian Bureau.

In connection with the topographic surveys, surveys of forest reserves, Indian Territory surveys, and the survey of the Idaho-Montana boundary line, the following aggregated results were obtained:

Two astronomic determinations of latitude and longitude were made; 3 base lines were measured; 21 observations for azimuth were obtained and the lines marked; 250 triangulation stations were established, occupied, and observed from; 314 miles of primary traverse were run, and 35,867 square miles were covered by the detailed topographic mapping, this area being distributed through 35 States and Territories; 12,957 miles of levels were run, and 2,354 permanent bench marks were established, these bench marks being iron posts, bronze tablets, or copper plugs. With reference to the land surveys, there were run 625 miles of standard lines, 2,324 miles of exterior or township lines, 22,210 miles of subdivisional or section lines, 831 miles of meander lines, and 188 miles of retracement of boundary lines. In addition, data were secured for the preparation of reconnaissance or sketch maps of the Lewis and Clarke, Bitterroot, Priest River, and Washington reserves, comprising an area of about 22,500 square miles. The distribution of the control, topographic, and leveling work in the various States and Territories is shown on Pls. I and II, in pocket.

The following table gives the details relating to topography and spirit leveling for the fiscal year:

Topographic surveys of the United States Geological Survey in 1897–98, including miles of levels run and permanent bench marks established.

State or Territory.	Contour interval.	Scale of publication.		Total area.	Levels.	
		1:62500	1:125000		Distance run.	Number of bench marks.
	Feet.	*Sq. miles.*	*Sq. miles.*	*Sq. miles.*	*Miles.*	
Alabama	100	.....	610	610	310	43
Arizona	100	.....	.....	*a* 50	.....	.....
California	25, 50, 100	985	1,255	*b* 2,720	607	165
Colorado	100	155	.....	155	301	83
Georgia	.....	.....	.....	.....	129	20
Idaho	100	.....	90	90	30	6
Illinois	5, 10, 20	646	.....	646	178	24
Indiana	10	145	.....	145	73	7
Indian Territory	50	.....	13,455	13,455	5,129	814
Iowa	20	30	254	284	53	10
Kansas	.....	.....	.....	.....	192	59
Kentucky	50, 100	.....	964	964	4	2
Maryland	20	384	.....	384	69	8
Minnesota	20	274	.....	274	50	5
Missouri	20	.....	170	170	147	5
Montana	50, 100	168	882	1,050	431	72
Nebraska	20	120	1,797	1,917	375	101
Nevada	100	.....	927	927	274	28
New Hampshire	20	398	.....	398	155	14
New Jersey	20	348	.....	348	.....	.....
New York	20	2,157	.....	2,157	537	77
North Carolina	50, 100	.....	370	*c* 500	255	38
North Dakota	20	.....	812	812	211	28
Ohio	50	.....	285	285	190	29
Oklahoma	.....	.....	.....	.....	107	13
Oregon	100	.....	431	431	106	23
Pennsylvania	20	27	.....	27	3	.....
South Dakota	20, 100	215	1,981	2,196	822	193
Texas	25	.....	1,040	1,040	860	225
Utah	50	223	.....	*d* 225	155	36
Vermont	20	35	.....	35	8	1
Washington	100	.....	1,462	1,462	224	51
West Virginia	20, 100	54	480	534	91	15
Wisconsin	20	163	678	841	299	35
Wyoming	100	.....	735	735	582	124
Total	.....	6,527	28,678	35,867	12,957	2,354

a 50 square miles on a scale of 1:63360, contour interval 200 feet.
b 480 square miles on a scale of 1:63360, contour interval 100 feet.
c 130 square miles on a scale of 1:45000, contour interval 20 feet.
d 2 square miles on a scale of 1:9600, contour interval 20 feet.

The following table shows the total areas, and the percentages, surveyed to date in the various States and Territories:

Table showing, by States and Territories, the present condition of topographic surveys and the new areas surveyed in 1897–98.

State or Territory.	Total area.	Area surveyed in 1897–98.	Area surveyed to date.	Per cent.
	Sq. miles.	*Sq. miles.*	*Sq. miles.*	
Alabama	52,250	.....	15,063	29
Arizona	113,020	50	56,790	50
Arkansas	53,850	.....	13,535	25
California	158,360	1,993	47,640	30
Colorado	103,925	155	33,026	32
Connecticut	4,990	.....	4,990	100
Delaware	2,050	.....	644	31
District of Columbia	70	.....	70	100
Florida	58,680	.....	1,821	3
Georgia	59,475	.....	14,007	24
Idaho	84,800	90	12,121	14
Illinois	56,650	436	4,435	8
Indiana	36,350	125	143	.....
Indian Territory	31,215	13,455	30,885	99
Iowa	56,025	254	5,817	10
Kansas	82,080	.....	61,094	74
Kentucky	40,400	20	10,266	25
Louisiana	48,720	.....	7,492	15
Maine	33,040	.....	3,810	12
Maryland	12,210	153	7,770	63
Massachusetts	8,315	.....	8,315	100
Michigan	58,915	.....	1,836	3
Minnesota	83,365	274	1,427	2
Mississippi	46,810	.....	29	.....
Missouri	69,415	170	28,158	41
Montana	146,080	1,050	35,783	24
Nebraska	77,510	1,797	23,985	31
Nevada	110,700	927	28,949	26
New Hampshire	9,305	398	2,396	25
New Jersey	7,815	.....	7,815	100
New Mexico	122,580	.....	27,777	22
New York	49,170	1,733	15,047	31
North Carolina	52,250	.....	12,252	23
North Dakota	70,795	812	6,327	9
Ohio	41,060	285	334	.....
Oklahoma	39,215	.....	4,146	10

Table showing, by States and Territories, the present condition of topographic surveys and the new areas surveyed in 1897–98—Cont'd.

State or Territory.	Total area.	Area surveyed in 1897-98.	Area surveyed to date.	Per cent.
	Sq. miles.	*Sq. miles.*	*Sq. miles.*	
Oregon	96,030	431	12,691	13
Pennsylvania	45,215	27	6,534	15
Rhode Island	1,250	.....	1,250	100
South Carolina	30,570	.....	3,900	12
South Dakota	77,650	1,032	15,447	19
Tennessee	42,050	.....	17,641	42
Texas	265,780	1,040	57,677	22
Utah	84,970	223	62,867	74
Vermont	9,565	35	2,844	29
Virginia	42,450	.....	29,227	68
Washington	69,180	1,462	3,971	6
West Virginia	24,780	54	16,886	68
Wisconsin	56,040	841	6,010	11
Wyoming	97,890	735	11,759	12
Total	3,024,880	30,057	784,699	26

DIVISION OF TRIANGULATION.

ATLANTIC SECTION.

The control for six 15-minute quadrangles in the southwestern portion of the Adirondack region was obtained by extending triangulation from Penn and Hamilton, stations of the United States Coast and Geodetic Survey, and from Starr, Schuyler, and Barto, stations of the New York State survey. This necessitated the building of sixteen stations and the occupation of ten of them, by Mr. W. J. Peters, topographer. He likewise extended triangulation in southwestern New York, west of Olean, so as to control the Salamanca quadrangle. Two stations, Learn and Clarksville, established the preceding year, were reoccupied, and two new stations were built and occupied.

In Maryland a scheme of triangulation, based upon Maryland Heights and Sugarloaf, stations of the Coast and Geodetic Survey, and extending westward beyond Cumberland, was planned and carried out so far as weather conditions permitted. Mr. R. H. Chapman, topographer, selected and built seven

stations between May 14 and June 6, 1897. Mr. George T. Hawkins, topographer, occupied six of these stations in June and selected and built eight more during the month of August. He also established a meridian line at Cumberland, Maryland. Mr. Peters occupied three of the triangulation stations in October, but, as intensely smoky weather prevailed, further attempts at observing were abandoned for the winter. Observations at these stations were resumed early in April, 1898, by Mr. Hawkins, and were completed early in June.

In Tennessee a traverse line was run by Mr. Hawkins from a copper bolt established at Columbia by Mr. Gilbert Thompson, topographer, in 1896, southward and westward along the railroad to Napier, thence along wagon roads to Mannie, where connection was made with a station of Mr. Peters's traverse of 1896, thus completing a circuit; thence westward from a copper bolt at Hohenwald (likewise established by Mr. Peters in 1896) to a bench mark of the United State Engineer Corps at Kellys Landing on the Tennessee River, the total distance traversed being 81 miles and the number of instrumental stations occupied being 700.

CENTRAL SECTION.

In this section Mr. Hawkins obtained control for the Yankton quadrangle, South Dakota, by extending triangulation southeastward from Pit and Schmidt, stations established by the Missouri River Commission on the southern bank of the river in Nebraska. Nine stations were built and occupied, and meridian lines were established at Yankton, South Dakota, and at Hartington, Nebraska, during the month of September. Early in October Mr. Hawkins connected by primary traverse Winfield, a station of the Mississippi River Commission about 40 miles northwest of St. Louis, Missouri, and the fifth principal meridian near Troy, Missouri, the distance traversed being 14 miles. He also ran a primary traverse from Lynch, a station in the transcontinental belt of the Coast and Geodetic Survey 5 miles south of Pacific, Missouri, along the St. Louis and San Francisco Railway to the astronomic pier established in 1884 at Springfield, Missouri, a distance of 200 miles. This traverse line furnished control for a large number of quad-

rangles in southwestern Missouri. Meridian lines were established at Marshfield, Lebanon, and Rolla.

In March, 1898, Mr. Hawkins established the longitude of the Illinois-Indiana State line near the fortieth parallel of latitude, connecting it by means of a traverse line 19 miles in length with Fairmount, a triangulation station of the United States Lake Survey in Vermilion County, Illinois.

ROCKY MOUNTAIN SECTION.

Prof. A. H. Thompson, geographer, extended triangulation from Texas Hill and Yegua Knob, 30 miles east of Austin, Texas, southward and westward, connecting with an astronomic station at San Antonio. During his field season, from June, 1897, to March, 1898, he built and occupied twenty-seven stations, and in addition established meridian lines at the county seats Gonzales, Seguin, and Bastrop. For the control of the area in the vicinity of Denver, Colorado, Mr. H. L. Baldwin selected a base 6 miles in length a few miles northeast of that city and made a preliminary measurement. He also selected and built ten stations in the expansion, obtaining angles at eight of them and establishing meridian lines at Denver and Boulder.

PACIFIC SECTION.

Control for this section was initiated in one locality, near Baker, Oregon. The astronomic location of a pier at Baker was determined in the usual manner by Mr. S. S. Gannett, topographer. He also measured a base line 6 miles in length along the railroad tangent between Baker and Haines and built and occupied five stations in its expansion, besides locating prominent peaks visible from the stations occupied. In connection with this work a meridian line was established at Baker, the astronomic pier marking its southern extremity.

FOREST RESERVES.

Primary control for the mapping of the forest reservations was established as follows:

ROCKY MOUNTAIN SECTION.

Lewis and Clarke Reserve, Montana.—The control is dependent upon the astronomic station of the Coast and Geodetic

Survey at Helena, Montana, and upon a base line, 4 miles in length, measured by Mr. R. H. Chapman, topographer, along the Northern Pacific Railroad near Helena. Mr. Chapman also built nineteen signals and occupied eighteen stations in the extension of the triangulation northwestward from Helena, eight of these stations falling within the reserve.

Bighorn Reserve, Wyoming.—Mr. T. M. Bannon, topographer, extended Mr. W. S. Post's triangulation of 1896 about 25 miles southwest of Cloud Peak, reoccupying three old stations and establishing ten new stations.

Teton Reserve, Wyoming.—Mr. Bannon also extended the triangulation executed by Mr. Post the preceding year 75 miles west from the one hundred and ninth meridian to Mount Sheridan and Younts Peak, which stations formed a base for the control which was extended over the reserve by Mr. Frank Tweedy, topographer, who built and occupied nine stations.

Black Hills Reserve, South Dakota.—Later in the season Mr. Tweedy extended triangulation over this reserve in South Dakota and Wyoming, establishing twelve new stations and reoccupying four old ones. A meridian line was located at Deadwood.

Uinta Reserve, Utah.—To obtain control for this reserve it was necessary to start from Deseret and Mount Nebo, stations of the Coast and Geodetic Survey in Utah, and extend a series of quadrilaterals northeastward for 70 miles. Thirteen stations were occupied, two of which are within the reserve. This work was done by Mr. H. L. Baldwin, topographer, during July, August, and September, 1897. Incidentally the southwestern corner of the State of Wyoming was connected with the triangulation. Mr. Baldwin also located meridian lines at Salt Lake City, Nephi, Provo, Tooele, Coalville, and Heber, Utah, and at Evanston, Wyoming.

PACIFIC SECTION.

Bitterroot Reserve, Montana-Idaho.—An astronomic station was made at Hamilton, Montana; a meridian line was established, a base line 5.3 miles in length was measured along the

railroad tangent passing through that place, and eight primary stations in the expansion were built and occupied by Mr. S. S. Gannett. From these primary stations a reconnaissance triangulation was extended over nearly the entire reserve in Montana and Idaho by Mr. J. B. Lippincott, who built and marked eleven stations, besides obtaining the approximate angles with a 7-inch vernier theodolite reading to 10 seconds.

Washington Reserve, Washington.—During the summer field season—July to October—a reconnaissance triangulation was extended over this reserve by Mr. A. H. Sylvester, assistant topographer. Stone monuments were built on sixteen of the highest mountain peaks and approximate measurements of the angles were obtained, the work being based upon the Ellensburg triangulation of 1895. A detailed triangulation of the lower portion of Lake Chelan was made by Mr. W. T. Griswold, topographer, and connected with that of Mr. Sylvester.

San Gabriel Timber Land Reserve, California.—In the fall, triangulation was extended over a portion of this reserve in southern California, starting from stations in the expansion of the Los Angeles base. Seven stations were occupied by Mr. S. S. Gannett, and in addition an azimuth line was established at Los Angeles.

San Jacinto Reserve, California.—During the winter Mr. A. H. Sylvester occupied five stations for the control of the San Jacinto quadrangle in southern California.

INDIAN TERRITORY SECTION.

Triangulation in Indian Territory was carried on throughout the year by one party, under the direction of Mr. C. F. Urquhart, topographer. In January, 1898, Mr. Urquhart completed the triangulation in the region occupied by the Cherokee and Choctaw nations, and proceeded at once to extend the triangulation over the territory embraced in the Chickasaw Nation. In the former localities, from June 14, 1897, to January 31, 1898, eighteen stations were built and final observations were taken from thirty stations.

In the Chickasaw country, from February 1 to June 30, 1898, there were built twenty-three stations, from which final

observations were taken, making a total of forty-one stations built and fifty-three observed from during the year.

During the prosecution of the work in Indian Territory a total of one hundred and thirty-eight stations have been built and final observations taken therefrom, thereby establishing control for an area of over 30,000 square miles.

IDAHO–MONTANA BOUNDARY LINE.

A duty imposed by law upon the Survey, as previously mentioned, was the location and marking of the boundary line between Idaho and Montana. It was provided that points on the meridian defining the boundary should be located by triangulation from the Spokane base of the Geological Survey, and it became necessary to extend a belt of triangulation over a longitudinal distance of about 70 miles before the line could be located and marked. On account of the alternation of smoke and storm throughout the field season, the work did not progress beyond or even to the completion of the necessary triangulation, but sufficiently far for the location of two stations, one a little over a mile east and the other about the same distance west of the boundary line. These stations were about 16 miles apart, one of them being near the point where the boundary starts northward from the crest of the Bitterroot Mountains.

The work was under the general direction of Mr. Richard U. Goode, geographer, and was performed in the field by Mr. E. T. Perkins, jr., topographer.

Fifteen triangulation stations were selected and signals built. Nine of these stations were observed from and one set of azimuth observations was made.

The technical details relating to this work are given in the Appendix, under the general head of Triangulation.

DIVISION OF TOPOGRAPHY.

ATLANTIC SECTION.

This section remained throughout the year, as heretofore, under the charge of Mr. H. M. Wilson, geographer Topographic work was carried on in eleven States, namely: New

Hampshire, Vermont, New York, New Jersey, Pennsylvania, Maryland, West Virginia, Ohio, Kentucky, North Carolina, and Alabama. Fourteen parties were engaged, to each of which was attached a subparty for leveling, and there was in addition one independent level party. The total area surveyed was 6,242 square miles, of which 3,403 square miles were on a scale of 1:62500; 2,709 square miles on a scale of 1:125000, and 130 square miles on the special scale of 1:45000. Of the above, 3,537 square miles consisted of a complete resurvey of work previously done. Of spirit levels, 1,751 linear miles were run, in the course of which 247 permanent bench marks were established.

New Hampshire–Vermont.—In this district field work was commenced on June 15 by Mr. R. D. Cummin, topographer, assisted by Mr. N. G. Van Doren, assistant topographer, who surveyed on the scale of 1:62500, with a contour interval of 20 feet, the Peterboro and Lancaster quadrangles in Cheshire, Hillsboro, Coos, and Grafton counties, New Hampshire, and Essex County, Vermont. The total area surveyed was 433 square miles, in connection with which 163 miles of spirit leveling were run and 15 permanent bench marks were established.

New York.—All of the parties operating in New York took the field about the middle of May. Mr. J. H. Jennings, topographer, surveyed portions of the Hamlin, Brockport, Salamanca, and Old Forge quadrangles. Mr. Frank Sutton, topographer, had general charge of the revision of the territory in the vicinity of New York, this revision being necessary on account of the large amount of culture which had been added since the original survey. Mr. Sutton was assisted during the season at various times by Messrs. E. B. Clark, R. D. Cummin, J W. Thom, and J. H. Wheat, topographers, and completed the revision of the Paterson, Staten Island, Brooklyn, and Harlem quadrangles. Mr. Sutton also surveyed a portion of the Old Forge quadrangle. Mr. Clark, in addition to the work above referred to, surveyed the Oyster Bay and Hempstead quadrangles and the larger portion of the Hamlin and Brockport quadrangles. Mr. W. H. Lovell, topographer, completed the survey of the Indian Lake quadrangle and a portion of the

Remsen quadrangle. Mr. C. C. Bassett, topographer, surveyed the Tully and portions of the Salamanca and Remsen quadrangles. Mr. A. M. Walker, topographer, surveyed the Cazenovia and a portion of the Remsen quadrangles. The new work above referred to was in the counties of Hamilton, Herkimer, Oneida, Lewis, Monroe, Genesee, Cattaraugus, Cortland, Onondaga, and Madison. All of the work in New York was on the scale of 1:62500, with a contour interval of 20 feet, and embraced an area of 2,505 square miles. In connection with the above, 537 miles of spirit levels were run and 77 permanent bench marks were established. Of the area surveyed, 772 square miles were embraced in the revisory survey of New York City and vicinity.

Maryland–Pennsylvania–West Virginia.—Mr. J. H. Wheat, topographer, assisted by Mr. W. C. Hall, topographer, commenced field work on June 20. The Frostburg quadrangle was surveyed and plane-table control was completed for the Flintstone quadrangle, the area covered being in Allegany and Garrett counties, Maryland; Bedford County, Pennsylvania; and Bedford, Somerset, Mineral, and Hampshire counties, West Virginia. The scale of the work was 1:62500 and the contour interval 20 feet. There were mapped 234 square miles, in connection with which 80 miles of spirit leveling were run and 10 permanent bench marks were established. In the spring of 1898 Mr. Hall completed a revision of the Baltimore quadrangle, embracing an area of 231 square miles, on a scale of 1:62500.

West Virginia.—Mr. Hersey Munroe, topographer, assisted by Mr. Glenn S. Smith, assistant topographer, commenced field work on June 20 and completed a resurvey of the Charleston quadrangle, in Kanawha, Putnam, Fayette, Boone, and Lincoln counties. They mapped 480 square miles, on a scale of 1:125000, with a contour interval of 100 feet. In connection with the above, 83 miles of spirit levels were run and 13 permanent bench marks were established.

Ohio–Kentucky–West Virginia.—Messrs. Munroe and Smith, upon the completion of the work in West Virginia, commenced the survey of the Ironton quadrangle, in the counties of Pike

and Gallia, Ohio; Boyd and Greenup, Kentucky; and Lawrence and Scioto, West Virginia. They completed the mapping of 305 square miles, on the scale of 1:125000, with a contour interval of 50 feet. In connection with this work 194 miles of spirit levels were run and 31 permanent bench marks were established.

Kentucky.—Mr. Albert Pike, assistant topographer, commenced field work on June 20, and resurveyed the Salyersville quadrangle, consisting of an area of 944 square miles in the counties of Magoffin, Breathitt, Menifee, Morgan, and Wolfe. The scale of the work was 1:125000, with a contour interval of 100 feet.

North Carolina.—Mr. W. L. Miller, topographer, commenced field work the latter part of June, and completed the resurvey of the Pisgah quadrangle, covering an area of 120 square miles, and also mapped 130 square miles of the Pisgah Forest, on a scale of 1:45000, in 50-foot contours. These areas were in Transylvania, Henderson, Buncombe, and Haywood counties. In October and November Mr. Miller, assisted by Mr. Pike, revised 250 square miles of the Cranberry quadrangle, in Caldwell, Watauga, and Mitchell counties. The revision work on the Pisgah and Cranberry quadrangles was on a scale of 1:125000, with a contour interval of 100 feet. In connection with the above work 75 miles of spirit levels were run and 12 permanent bench marks were established.

Alabama.—Messrs. Walker and Thom, upon the completion of the areas assigned to them in New York, in the latter part of September, were transferred to Alabama, and were engaged on the Anniston and Fort Payne quadrangles, in Etowah, Cherokee, Dekalb, Cleburne, and Calhoun counties, until the middle of January, when they were relieved by Mr. Smith. The result of the combined work was the completion of the resurvey of 610 square miles, on the scale of 1:125000, with a contour interval of 100 feet. In connection with the above work 310 linear miles of spirit levels were run and 43 permanent bench marks were established.

North Carolina–Tennessee–Georgia.—Mr. W. C. Hall, topographer, commenced on October 10 a line of precise levels, which

he carried from Paint Rock, North Carolina, to Atlanta, Georgia, a distance of 309 miles, in connection with which he established 46 permanent bench marks.

CENTRAL SECTION.

Mr. John H. Renshawe, geographer, remained in charge of this section. Topographic work, including leveling, has been prosecuted in the districts of Minnesota, North Dakota, South Dakota, Iowa-Wisconsin, Illinois-Indiana, Nebraska, and Missouri. Leveling without topography has been carried on in Wyoming, Kansas, and Oklahoma. During the season seven topographic parties were maintained, the result of the work being the completion of ten quadrangles, and also the survey an irregular area of about 227 square miles along the Vermilion iron range of northern Minnesota. In addition, certain areas in the vicinity of Chicago, Illinois, and Omaha, Nebraska, were revised, to meet the requirements made necessary by the continually increasing amount of culture. The total area surveyed embraced 5,906 square miles, of which 1,378 square miles were on a scale of 1:62500, and 4,528 square miles were on a scale of 1:125000, 380 square miles consisting of surveys of revision. Of levels 1,965 linear miles were run, resulting in the establishing of 342 permanent bench marks.

Minnesota.—Work was commenced about the middle of June in the Vermilion iron district, in St. Louis County, by a party in charge of Mr. Robert Muldrow, topographer. Operations were continued until the end of September, during which time 227 square miles were surveyed, on a scale of 1:62500, with a contour interval of 20 feet, the area extending in a strip about 10 miles in width from Tower eastward along the range to a point about 20 miles east of Ely. In connection with this work 23 miles of spirit levels were run.

North Dakota.—Work was resumed by Mr. W. H. Griffin, topographer, assisted by Mr. Basil Duke, assistant topographer, in the upper valley of the James River, adjoining on the north the area surveyed the previous season. The party commenced work about June 20 and continued in this locality until the end of August, during which time the Pingree quad-

rangle, comprising an area of 812 square miles, in Stutsman and Foster counties, was surveyed, on a scale of 1:125000, with a contour interval of 20 feet. In connection with the topographic work 211 miles of spirit levels were run and 28 permanent bench marks were established.

South Dakota.—Upon the completion of the work above referred to, Mr. W. H. Griffin commenced operations, in the early part of September, on the Canton quadrangle, comprising an area of 871 square miles, in Turner, Lincoln, Clay, and Union counties, and extending across the Big Sioux River for 3 or 4 miles into Iowa. The scale of the work was 1:125000, with a contour interval of 20 feet. In connection with the above, 178 miles of spirit levels were run and 24 permanent bench marks were established. Upon the completion of the field work in this quadrangle the party was disbanded, and returned to the office about November 1.

Minnesota–Wisconsin.—Field work was commenced about June 15 by a party in charge of Mr. Paul Holman, the result being the completion of the St. Croix Falls quadrangle, embracing an area of 210 square miles in Chisago and Washington counties, Minnesota, and Polk County, Wisconsin. The scale of the work was 1:62500, with a contour interval of 20 feet. In connection with the above, 144 miles of levels were run and 18 permanent bench marks were established.

Illinois–Indiana.—Mr. R. C. McKinney, topographer, assisted by Mr. Nat Tyler, jr, topographer, commenced work about July 1, and during this month and August the Evanston and Highwood quadrangles, embracing an area of 233 square miles in Cook and Lake counties, were surveyed, on a scale of 1:62500, with a contour interval of 10 feet. Upon the completion of this work Mr. McKinney and his party were transferred to Indiana. Returning from Indiana the latter part of September, Mr. McKinney and his assistant began the revision of the work on the Chicago and Calumet quadrangles, completing an area of 230 square miles. On October 1 Mr. Tyler was transferred to Wisconsin, leaving Mr. McKinney alone to finish the work about Chicago. This was completed the last of October. In connection with the topographic work on the

Evanston and Highwood quadrangles 96 miles of spirit levels were run and 17 permanent bench marks were established. Field work on the Danville quadrangle, in Vermilion County and extending about 2 miles into Indiana, was commenced near the middle of November, by Mr. W. J. Lloyd, topographer, assisted by Mr. E. C. Bebb, assistant topographer. The work, which was completed the latter part of January, was on a scale of 1:62500, with a contour interval of 10 feet. In connection with the topographic work 89 miles of spirit levels were run and 7 permanent bench marks were established.

Indiana.—As above referred to, Messrs. McKinney and Tyler were transferred about the 1st of August to Indiana and completed the survey of the Tolliston quadrangle, embracing an area of 100 square miles in Lake County. The topographic mapping was on the scale of 1:62500, with a contour interval of 10 feet. In connection with the above, 66 miles of levels were run and 7 permanent bench marks were established.

Iowa–Wisconsin.—Work was continued in this district by a party under the charge of Mr. C. E. Cooke, topographer. Field operations were commenced the latter part of June and continued until the middle of November, the result being the completion of the survey of the Lancaster quadrangle, embracing an area of 878 square miles in Duke and Clayton counties, Iowa, and Grant County, Wisconsin, on a scale of 1:125000, with a contour interval of 20 feet. Mr. Cooke was assisted by Mr. Tyler after October 1. In connection with this work 235 miles of levels were run and 32 permanent bench marks were established.

Missouri.—Upon the completion of the work in the Minnesota–Wisconsin district, Mr. Paul Holman and party resumed work on the O'Fallon quadrangle, lying in the valley of the Missouri River west of St. Louis, in St. Louis, St. Charles, Lincoln, and Franklin counties. Work was continued until the first part of November, during which time 170 square miles were surveyed, on a scale of 1:125000, with a contour interval of 50 feet. In connection with this work 147 miles of levels were run and 5 permanent bench marks were established.

Nebraska.—Field work was resumed in the western part of the State about June 15 and continued until November 1 by

a party in charge of Mr. H. B. Blair, topographer. The area surveyed comprised the Chappell and Ogalalla quadrangles, embracing an area of 1,797 square miles, in Deuel, McPherson, and Keith counties. The work was on a scale of 1:125000, with a contour interval of 20 feet, in connection with which 375 miles of levels were run and 101 permanent bench marks were established. In the spring of 1898 an area of about 150 square miles in the Omaha and Plattsmouth quadrangles was revised by Mr. Nat Tyler, jr.

Wyoming.—Spirit leveling was resumed and carried on from about the middle of July to the middle of September. It adjoined the work done the preceding season, and was continued northward and westward across the Patrick and Hartville quadrangles, connecting with the levels of the Cheyenne and Northern Railroad at Wheatland. There were 102 miles of levels run and 31 permanent bench marks established, by a party in charge of Mr. M. C. McFarlane.

Kansas.—Leveling work was commenced in this district about September 15 and continued until November 15, during which time 192 miles of levels were run and 59 permanent bench marks were established. The work was done by Mr. McFarlane, and extended over the greater part of the Hartland and Syracuse quadrangles, in Turner, Kearny, Hamilton, Staunton, Grant, and Haskell counties.

Oklahoma.—Leveling was carried on during the months of November and December in the southern part of this Territory by Mr. Robert Coe, during which time 107 miles of levels were run and 13 permanent bench marks were established.

ROCKY MOUNTAIN SECTION.

This section remained throughout the year, as heretofore, under the direction of Mr. E. M. Douglas, geographer. Topographic work was carried on by five parties in Montana, South Dakota, and Colorado. In addition, after the season was closed in the Northwest, two of these parties were transferred to Texas. The total area surveyed amounted to 1,916 square miles, all of which consisted of new work or the resurvey on a larger scale of territory that had been previously mapped.

Classified by scale, 538 square miles were on the scale of 1:62500, and 1,378 square miles were on the scale of 1:125000. There was a total of 1,595 miles of levels run and 386 permanent bench marks were established.

Montana.—Mr. W. J. Lloyd, topographer, commenced field work on June 25 and was engaged until the end of September, during which time he completed the survey of the Boulder quadrangle, in the counties of Deerlodge, Lewis and Clarke, Jefferson, and Silver Bow. The area covered amounted to 338 square miles, and the work was on the scale of 1:125000, with a contour interval of 100 feet. Work was commenced on the Helena special quadrangle by Mr. Gilbert Thompson about the 1st of July, the scale being 1:62500, with a contour interval of 50 feet, and was continued until December 21, during which time 143 square miles were surveyed. Mr. Lloyd was also engaged in this locality during the month of October, and surveyed 25 square miles. These two areas were included in the counties of Lewis and Clarke, Jefferson, and Meagher. In connection with the Montana work 274 linear miles of levels were run and 50 permanent bench marks were established.

South Dakota.—Mr. William H. Herron, topographer, assisted by Mr. Arthur Stiles, assistant topographer, surveyed between June 25 and October 25 the Sturgis quadrangle, in Lawrence and Meade counties. The total area mapped was 215 square miles, and the work was on a scale of 1:62500, with a contour interval of 100 feet. In connection with the above, 160 miles of levels were run and 28 permanent bench marks were established.

Colorado.—Mr. W. M. Beaman, topographer, commenced work on the Engineer Mountain quadrangle on July 5 and was engaged until the last of October, during which time he surveyed an area of 155 square miles, in the counties of Dolores, San Juan, and La Plata. The work was on the scale of 1:62500, with a contour interval of 100 feet. In connection with the above, 46 miles of levels were run and 12 permanent bench marks were established. In addition, 255 miles of levels were run and 71 permanent bench marks were established for the control of the East Denver and Greeley quadrangles, in Arapahoe, Wells, and Boulder counties.

Texas.—Work was commenced on the Flatonia quadrangle on November 6 by Mr. Beaman, and on December 25 by Messrs. Herron and Stiles. Messrs. Herron and Beaman were withdrawn from the field in the spring, and the work was completed by Mr. Stiles. The territory surveyed embraced an area of 1,040 square miles, in the counties of Fayette, Gonzales, Bastrop, and Caldwell. The work was on the scale of 1:125000, with a contour interval of 25 feet. In connection with the above, and also for the control of the Bastrop quadrangle, in the counties of Bastrop, Travis, Williamson, and Lee, 860 miles of levels were run and 225 permanent bench marks were established.

PACIFIC SECTION.

Mr. Richard U. Goode, geographer, continued in charge of this section. Topographic work with leveling was prosecuted in six States—Washington, Oregon, Utah, Nevada, California, and Arizona—one or more parties being engaged in each locality. The area surveyed embraced 3,332 square miles, of which 469 square miles were on a scale of 1:62500; 2,331 square miles were on a scale of 1:125000, and 532 square miles were on special scales. Of the above, 482 square miles consisted of revision of work previously done. There was a total of 856 miles of spirit levels run, in connection with which 173 permanent bench marks were established. In some localities the character of the country was such, on account of its precipitous nature, as to prohibit the running of accurate lines of spirit levels, so that in certain cases bench marks sufficient to meet the requirements of the law were established by careful vertical angulation. Whenever the bench marks were so established copper bolts or bronze tablets were let into the solid rock and marked in the same way as those whose elevations had been determined by spirit leveling.

Washington.—The survey of the Mount Stuart quadrangle, in Kittitas County, was completed by Mr. George E. Hyde, topographer, during the latter half of June, 45 square miles being surveyed. Immediately afterwards the survey of the Snoqualmie quadrangle was commenced and operations were carried on until the last of November, when the party was forced to disband on account of deep snow. In the Snoqual-

mie quadrangle 665 square miles were surveyed, in Kittitas and King counties. The scale of the work above referred to was 1:125000, with a contour interval of 100 feet. In connection with these surveys 60 miles of levels were run and 21 permanent bench marks were established, 10 being determined by spirit leveling and 11 by vertical angulation.

Oregon.—Mr. A. E. Murlin, topographer, with two assistants, was detailed for the survey of the Port Orford quadrangle, in Coos and Curry counties, and was engaged in this work from the first part of July till the latter part of November, when the party was disbanded on account of continuous rains. An area of 431 square miles, on a scale of 1:125000, with a contour interval of 100 feet, was surveyed. In connection with this work 106 miles of levels were run and 23 permanent bench marks were established.

Utah.—Mr. R. B. Marshall, topographer, assisted by Mr. A. B. Searle, topographer, was detailed for the survey of the Tintic quandrangle, in Juab and Utah counties. Work was commenced on June 24 and completed on August 31, the territory surveyed embracing an area of 223 square miles, on a scale of 1:62500, with a contour interval of 50 feet. In this work 98 miles of spirit levels were run and 11 permanent bench marks were established.

The limits of the Tintic special map, which had been surveyed the previous season, were readjusted so as to require the additional survey of small areas to the north, west, and south. A small amount of revision of the work of the preceding year was also found to be necessary. Mr. Marshall commenced this work on September 1 and completed it on October 10, during which time he surveyed, on a scale of 800 feet to the inch, with a contour interval of 20 feet, 2.3 square miles of additional area.

Nevada.—Upon the discontinuance of work in connection with the forest surveys in Washington, Mr. W. T. Griswold was assigned to the survey of the Silver Peak quadrangle, in Esmeralda County, Nevada, and Mono County, California. His entire outfit of men, animals, and material was transported by rail to the new field of work. Operations were begun about November 1 and were continued through the winter and

spring months, the result being the completion of the work assigned, embracing an area of 944 square miles, surveyed on a scale of 1:125000, with a contour interval of 100 feet. In connection with this work 274 miles of levels were run and 28 permanent bench marks were established.

California.—In order to meet a very general demand on the part of those having mining interests in the Mother Lode region of the gold belt of California, it was decided to prepare four mining-claim maps extending diagonally across the Jackson and Sonora quadrangles. Upon the completion of the work in Utah Mr. A. B. Searle, topographer, was assigned to the Jackson area, and Mr. E. C. Barnard, upon the completion of his work in connection with the survey of the forest reserves in Montana, was detailed to the Sonora area. The work undertaken consisted in revision and correction of existing sheets, which were photographed up to the scale of 1 mile to the inch, and the addition of the mining claims, the lines of the public-land surveys, and such cultural features as were lacking. The area surveyed was divided into four sections, aggregating about 480 square miles. Mr. Searle commenced work on October 20 and finished the two maps included in the Jackson quadrangle on February 14. He was then detailed to make certain tracings in San Francisco. Mr. Barnard commenced work about the middle of November on the two areas included in the Sonora quadrangle and was engaged until February 23, when he was ordered to Washington and detailed for work in connection with the Alaskan surveys, Mr. Searle relieving him and completing the work on March 18.

Upon the completion of the topographic work in Utah Mr. R. B. Marshall, topographer, was transferred to southern California for the purpose of surveying the Riverside quadrangle. He commenced work on November 16 and finished on February 16, during which time he completed the survey of the territory assigned, embracing an area of 246 square miles, on the scale of 1:62500, with a contour interval of 25 feet. In connection with the work 57 miles of levels were run and 15 permanent bench marks were established. It was considered that the territory included within the 30-minute quadrangle containing Riverside—the Elsinore quadrangle—with the excep-

tion of the northwest quarter, was not of sufficient importance to warrant a survey on the scale of 1:62500. Therefore, upon the completion of the Riverside quadrangle, Mr. Marshall commenced work on the Elsinore quadrangle on the scale of 1:125000, with 50-foot contours, and finished the northeast quarter on March 22, embracing an area of 246 square miles, at which time he was directed to report in Washington for office work. The Elsinore quadrangle embraces portions of Orange, Riverside, and San Diego counties.

In order to establish a basis for the levels in the vicinity of Riverside, it was necessary to carry a line of levels from the Pacific Ocean eastward. Mr. H. S. Crowe was employed for this purpose, and during the months of July, August, and September ran levels with a double rod from the Coast Survey bench marks at Santa Monica and San Pedro to Los Angeles and thence eastward to Colton, extending branch lines to Riverside and San Bernardino. Mr. George H. Herrold carried level lines based on the above over the Elsinore quadrangle. Mr. Crowe ran 130 miles of levels and established 48 permanent bench marks, and Mr. Herrold ran 188 miles and established 42 permanent bench marks. The above figures relating to Mr. Herrold's work include those given for the Riverside quadrangle, which constitutes the northwest quarter of the Elsinore quadrangle.

Arizona.—Mr. T. G. Gerdine, topographer, was detached from the surveys in the San Gabriel Timber Land Reserve and was engaged from November 1 to 28 in the survey of certain land in Arizona in connection with the timber trespass suit on the part of the United States against D. D. Ross and the Copper Queen Consolidated Mining Company. About 50 square miles were mapped with a sufficient degree of accuracy to meet the requirements of the case involved.

FOREST RESERVES.

ROCKY MOUNTAIN SECTION.

Black Hills Reserve, South Dakota.—Topographic work, under Mr. A. F. Dunnington, topographer, was commenced early in July and continued until about the middle of December, when adverse weather conditions rendered it impossible to proceed

further. The work consisted of resurveys of portions of Lawrence, Pennington, and Custer counties, comprising a portion of the south half of the Deadwood quadrangle, a portion of the Harney Peak quadrangle, and a strip west of the above, extending to the State line. Messrs. William H. Herron and R. H. Chapman, topographers, and Arthur Stiles, assistant topographer, also assisted in this locality for a short time. Two level parties were maintained and three parties were engaged in the subdivisional surveys. The scale of the work was 1:125000, with a contour interval of 100 feet. The total results obtained in this reserve are summarized as follows· One thousand one hundred and sixty-four square miles of detailed topography were mapped, including the sketching of timber lines; 484 miles of spirit levels were run; 141 permanent bench marks were established, and in connection with the land surveys 6 miles of standard lines, 103 miles of township lines, and 405 miles of section lines were run.

Bighorn Reserve, Wyoming.—Two topographic parties were engaged in this reserve, under Messrs. W. B. Corse and H. S. Wallace, topographers. Mr. Corse commenced field work on July 8 on the Bald Mountain quadrangle, in Bighorn and Sheridan counties, but his party was disbanded on September 5 on account of serious illness in his immediate family. During the time he was engaged an area of 245 square miles was mapped. The party of Mr. Wallace commenced a survey of the Cloud Peak quadrangle, in Bighorn and Johnson counties, on the 12th of August and continued in the field until November 2, during which time an area of 490 square miles was surveyed. The scale of the work was 1:125000, with a contour interval of 100 feet. In connection with the above work 330 miles of spirit levels were run and 80 permanent bench marks were established.

Teton Reserve, Wyoming.—Field work was commenced about the middle of July and was continued until the middle of October by a topographic party under the charge of Mr. Frank Tweedy, topographer. The results accomplished consisted in the running of 150 miles of spirit-level lines, the establishment of 13 permanent bench marks, the traverse survey of 173 miles of road, and the location of 60 land-survey corners. The

work is now in such condition that detailed topographic surveys can be commenced at any time.

Uinta Reserve, Utah.—Upon an examination of the country included in this reserve it was deemed impracticable, and for the present unnecessary, to make subdivisional surveys, and there did not exist a proper basis for the commencement of detailed topographic work. It was therefore planned to commence triangulation, reference to which is made elsewhere (p. 94), and also to establish a vertical basis by spirit leveling. In this connection 57 miles of levels were run and 25 permanent bench marks were established.

PACIFIC SECTION.

Bitterroot Reserve, Idaho-Montana.—Topographic work was commenced in the Bitterroot Valley under the general direction of Mr. E. C. Barnard, topographer, the first part of July and was continued until the latter part of October, when the adverse weather conditions prohibited further operations. There were two parties engaged in topographic mapping. The one under Mr. Barnard surveyed 634 square miles of the Hamilton quadrangle, extending over portions of the Bitterroot Valley and westward to and a little beyond the crest of the Bitterroot Mountains, the area being included in Ravalli County, Montana, and Idaho, Shoshone, and Lemhi counties, Idaho. The work was on the scale of 1:125000, with a contour interval of 100 feet. In connection with the above, 157 miles of levels were run and 22 permanent bench marks were established. In addition to the detailed topographic mapping, a party under Mr. J. B. Lippincott was organized for the purpose of extending a reconnaissance survey over the entire area of the Bitterroot Forest Reserve. This work was successfully executed, the result being the preparation of a map, on a scale of 6 miles to the inch, with sketch contours, extending over an area of about 6,500 square miles. The boundaries of this reserve were defined in part by the lines of the public-land system, none of which had been surveyed. For the purpose of locating the east boundary, and also for establishing a basis from which other township and section lines could be

projected, a special party was organized. The Montana base line was extended westward for a distance of 12 miles and from this were projected northward and southward various township lines. This work was prosecuted with the greatest difficulty, owing to the rugged and precipitous nature of the territory traversed. A summary of the linear miles of land survey is as follows: Standard lines, 21 miles; township lines, 38 miles; meander lines, 6 miles.

Priest River Reserve, Idaho.—No surveys of any kind, except a small amount of land subdivision, had been made in this area. It was therefore decided to extend the township lines, to establish lines of levels, and to arrange for triangulation, so that detailed mapping could follow during the next field season. Mr. D. C. Harrison, topographer, was in charge of the surveying operations in this locality. The thirteenth standard parallel north of the Boise meridian was extended westward from the existing termination, which was 3 miles west of the Boise meridian, to the State line between Idaho and Washington, a distance of about 27 miles, and connection was made with one of the mile posts of the latter line. From this standard parallel a guide meridian was projected northward from a point 24 miles west of the Boise meridian to the location of the international boundary, as well as could be determined, there being no surface mark indicating the exact location. In addition, information was secured sufficient to prepare a reconnaissance map of the entire reserve, and level lines were carried from Priest River station to Priest Lake, and from the northern end of Priest Lake to the upper lake, the connection between the stages of water at the lower and upper extremities of Priest Lake being determined by a series of synchronous observations. A system of secondary triangulation was carried the entire length of Priest Lake, and meander lines were run along the shore line of the lake, connecting the triangulation stations A summary of the results accomplished is as follows: Reconnaissance topography, 1,000 square miles; level lines, 30 miles; permanent bench marks established, 6; and in connection with the land surveys, 66 miles of standard and 63 miles of meander lines were run.

Washington Reserve, Washington.—Two separate organizations were effected, one operating in the eastern portion of the reserve, in the vicinity of Lake Chelan, under Mr. W. T. Griswold, topographer, and the second in the territory west of the summit of the Cascade Range, under Mr. L. C. Fletcher, topographer, assisted by Mr. T. G. Gerdine, topographer, which was organized at Monte Cristo. In the section east of the summit of the Cascade Range detailed topographic mapping was commenced the latter part of June and was continued until about the middle of October, when Mr. Griswold's party was transferred to Nevada. The area surveyed embraced 352 square miles in the basin of Lake Chelan, comprising portions of Waterville and Lake Chelan quadrangles, in Okanogan County. This work included a careful survey of the shore line of the greater portion of Lake Chelan. Level lines were carried from a bench mark previously established by the Army Engineer Corps at Chelan Falls, on the Columbia River, to the lower end of Lake Chelan. A connection between the lower and the upper end of the lake was established by synchronous water-height observations, and from the head of the lake the levels were continued to the summit of the Cascade Mountains at Cascade Pass. Connections were obtained with the existing subdivisional surveys, so that land lines may be projected in their proper location over the portion of the territory surveyed.

Operations in the vicinity of Monte Cristo were commenced about the 1st of July, and were prosecuted under the greatest difficulty on account of the alternation of smoke and stormy weather, it being found necessary to discontinue work entirely about the 1st of November, as the snow in the mountains made work impracticable. At this time Mr. Fletcher's party was transferred to California. During the season topographic surveys were extended over an area of 400 square miles, including portions of Sauk, Skykomish, Stillaguamish, and Sutton quadrangles, in Skagit, Snohomish, and Okanogan counties, and level lines were run over the existing roads and practicable trails. In addition, various other elevations were determined by vertical angles and permanently marked,

so as to meet the requirements of the law that at least one bench mark shall be established in each township surveyed. The work in this reserve was on the scale of 1:125000, with a contour interval of 100 feet. A summary of the results obtained by the combined parties in the Washington Reserve is as follows: 752 square miles of detailed topography were mapped, 164 miles of levels were run, and 30 permanent bench marks were established.

San Gabriel Timber Land Reserve, California.—Messrs. Fletcher and Gerdine, after work was suspended in the Washington Reserve, were transferred, as above mentioned, to southern California, and work was immediately begun in the San Gabriel Timber Land Reserve. The party continued in the field until the end of February and completed the survey of the Fernando and Tujunga quadrangles, embracing an area of 492 square miles, on a scale of 1:62500, with a contour interval of 50 feet. The area surveyed was in Los Angeles County, and this work completed the mapping of the entire drainage basin of the Los Angeles River. In connection with the above, 125 miles of levels were run and 40 permanent bench marks were established.

San Bernardino Reserve, California.—About the 1st of January Mr. Paul Holman, topographer, was detailed to revise the Redlands quadrangle, which, in connection with the San Bernardino quadrangle, already satisfactorily mapped, embraced the most important portion of the San Bernardino Forest Reserve. This work was completed about the 1st of April, the area covered being 247 square miles, on the scale of 1:62500, with a contour interval of 50 feet.

San Jacinto Reserve, California.—Mr. E. T. Perkins, jr., topographer, with Mr. A. H. Sylvester, assistant topographer, was assigned to this area the latter part of November, and during a field season extending through the winter and spring completed the survey of the San Jacinto quadrangle, on the scale of 1:125000, with a contour interval of 100 feet, covering an area of 992 square miles in Riverside County. In connection with the above work 164 miles of levels were run and 35 permanent bench marks were established by Mr. G. H. Herrold

INDIAN TERRITORY SECTION.

This section remained throughout the entire fiscal year in charge of Mr. C. H. Fitch, and operations were continued under the plan approved by the Secretary of the Interior March 21, 1895.

Field and office work was suspended, on account of the exhaustion of funds, April 17, 1897. Work was resumed early in June, when the Indian bill for the fiscal year 1897–98 became a law. About the middle of June the general headquarters were moved from South McAlester, Indian Territory, to Denison, Texas. This change became necessary on account of the inconvenient location of South McAlester.

An additional appropriation of $100,000 was provided June 6, 1897, to complete the survey of the unsurveyed lands in Indian Territory. This amount was nearly exhausted in December, 1897, and an appropriation of $30,000 was made available upon the approval of the urgent deficiency bill, January 28, 1898. This additional amount would not have been necessary had the survey progressed without interruption, but the furlough in the spring of 1897, caused by the delay in the provision of funds, and the long moves of parties in reorganization, added considerably to the expense.

The resurvey of the lands of the Chickasaw Nation was provided for in the Indian act approved June 6, 1897, which appropriated $141,500 for this purpose.

A summary of the mileage of the subdivisional survey of Indian Territory, exclusive of the lands of the Chickasaw Nation, is as follows: Total number of miles surveyed from June 14, 1897, to June 30, 1898, 10,333. Of this mileage, 320 are township exteriors, 397 are meanders, and 9,616 are section lines.

The total number of miles surveyed in the territory of the Chickasaw Nation is 15,137. Of this mileage, 532 are standard, 1,863 are township exteriors, 12,189 are section lines, 365 are meanders, and 188 are retracement of boundary lines.

The total mileage of the subdivisional survey of Indian Territory, including the lands of the Chickasaw Nation, for the fiscal year ending June 30, 1898, is 25,470. The total number

of miles surveyed in Indian Territory since the inception of the work is 63,881.

The topographic mapping has been prosecuted contemporaneously with the subdivisional work, an area of 6,103 miles having been surveyed since June 14, 1897, in Indian Territory, exclusive of the area belonging to the Chickasaw Nation. In the latter there have been 7,352 square miles mapped, making a total of 30,885 square miles since the beginning of the work. In connection with the topographic work, 2,813 miles of spirit levels were run along railroad and township lines in Indian Territory, exclusive of the area of the Chickasaw Nation, in which 2,316 miles were run. In connection with the level work 814 permanent bench marks were established. In addition to the above, 1,323 miles of vertical angle lines were run in Indian Territory, exclusive of the area of the Chickasaw Nation, in which 2,447 miles were run. The total mileage of levels and vertical angles since the beginning of the work is 17,897.

Mr. Van H. Manning continued to assist Mr. Fitch in his administrative duties. Those who, during the entire year, have been in charge of subdivision parties and at the same time have been personally engaged in topographic work, are Messrs. R. A. Farmer and R. H. McKee, topographers, and C. W. Goodlove and Duncan Hannegan, assistant topographers, Mr. Hannegan having been transferred to this section in October, 1897. The assistants in charge of subdivision, standard, and exterior parties have been Messrs. Jeremiah Ahern, F. W. Alvord, F. M. Johnson, W. A. Lindsay, M. P. McCoy, A. D. Morton, Sledge Tatum, W. T. Turner, and J. C. Wilkinson. Mr. W. S. Post, topographer in charge of a party, was transferred from this section to the Alaska work March 15, 1898, and was succeeded by Mr. W. T. Turner. Mr. F. W. Alvord resigned March 31, 1898.

The transcription of the standard parallel, guide meridian, township, and subdivision notes from the original field notes, and the construction of plats for each township, have progressed satisfactorily in the office at Denison. Typewritten copies of the matter were made in triplicate. From June 14,

1897, to June 30, 1898, notes of 376 townships were transcribed and 489 townships and 29 exterior plats were drawn relating to Indian Territory, exclusive of the area of the Chickasaw Nation. Sixteen plats relating to the area of the Chickasaw Nation were drawn from June 14, 1897, to June 30, 1898. Since the beginning of the work the notes of 654 townships have been transcribed, and triplicate copies of 502 townships have been typewritten. Township and exterior plats to the number of 730 have been made, 84 of which were made in Washington. The final drawing of twelve topographic sheets has been completed since the beginning of the work, and five others are in course of preparation.

SURVEYS IN ALASKA.

An act approved January 28, 1898, making appropriations to supply urgent deficiencies, provided $20,000 for surveys in Alaska. In pursuance of this legislation a combined expedition of geologists and topographers was organized. The expedition was outfitted in Seattle, Washington, under the direction of Mr. G. H. Eldridge, geologist, and sailed northward on the U. S. gunboat *Wheeling* on April 5. The topographers assigned to the expedition were Messrs. E. C. Barnard, W. J. Peters, W. S. Post, and Robert Muldrow.

Upon reaching Skagway two parties were detached, one in charge of Mr. Barnard and the other in charge of Mr. Peters. These parties, organized under the general direction of Mr. Barnard, successfully crossed the Chilkoot Pass, having reached the head of Lake Bennett when last heard from, on April 21. They were to descend the Yukon and remain together until the mouth of the White River was reached, at which point the Peters party, with Mr. Alfred Brooks as geologist, was to enter upon a special field of work—the exploration of the White and Tanana river systems. It is expected that this party will descend the Tanana to its mouth, and, should time permit, will explore the Melozikakat River, with a view to future operations on the Koyukuk River. The Barnard party was to proceed to the Klondike region for the purpose of making a topographic survey of the district adjacent to the eastern boundary of Alaska, the one hundred and forty-first

meridian. It was planned to extend the surveys westward from the Yukon between the sixty-fourth and sixty-fifth parallels of latitude and to include the Fortymile district. The map to be made by Mr. Barnard's party was designed to serve as a basis for a careful geologic investigation of the region. The topographic work in this locality was to be on the scale of about 4 miles to the inch, and, in addition, it was proposed to map on the scale of 1 mile to the inch a small area including and adjacent to the new military post on the Yukon.

Messrs. Muldrow and Post were attached to parties under the direction of Messrs. Eldridge and Spurr, geologists, respectively. After having landed the Barnard and Peters parties at Skagway, Mr. Eldridge, with the remaining members of the force, continued in the *Wheeling* to Cook Inlet, from which point he was to proceed with the entire corps then with him up the Sushitna to about latitude 63° 40′, where several forks of the river combine. At this point the Eldridge party, with Mr. Muldrow as topographer, was to commence the exploration of the northeast portion of the Sushitna drainage basin, and, if possible, to close on Mr. Peters's survey down the Tanana. The other party, under Mr. Spurr, with Mr. Post as topographer, was to proceed westward across the divide between the Sushitna and the Kuskokwim for the purpose of surveying the headwaters of the Kuskokwim and of determining the navigability of that stream by descending to the usual portage to the lower Yukon.

All the parties were expected to rendezvous at St. Michael by September 15. General instructions to the topographers were issued, as follows:

An attempt will be made to carry a continuous transit stadia line over the whole route traversed, starting from a position in latitude and longitude at sea level, as nearly as may be determined, and closing in the same way.

The routes traversed will be critically inspected with a view to ascertaining the most practicable location for trails, wagon roads, or railroads; the character and extent of the timber will be noted, and the rivers or streams will be examined as to the possibilities of navigation and the height of falls or rapids; and the rise and fall of tides will be recorded.

OFFICE WORK.

The office work has consisted in the computation of field observations relating to the Division of Triangulation, the adjustment of the results of spirit leveling and the tabulation

of the list of bench marks, the preparation of the final drawings of the topographic maps, and the writing of the notes relating to the public-land surveys, including the drawing of the necessary plats. The table herewith shows the atlas sheets, numbering 64, which have been completed and submitted for engraving during the office year 1897–98.

Topographic sheets completed in office, ready for engraving, during 1897–98.

State and sheet.	Scale.	Contour interval.
New Hampshire–Vermont:		*Feet.*
Peterboro	1:62500	20
Lancaster	1:62500	20
New York:		
Indian Lake	1:62500	20
Old Forge	1:62500	20
Remsen	1:62500	20
Tully	1:62500	20
Cazenovia	1:62500	20
Hamlin	1:62500	20
Brockport	1:62500	20
Salamanca	1:62500	20
Brooklyn (resurvey)	1:62500	20
Oyster Bay	1:62500	20
Hempstead	1:62500	20
New Jersey–New York:		
Paterson (resurvey)	1:62500	20
Harlem (resurvey)	1:62500	20
Staten Island (resurvey)	1:62500	20
Maryland:		
Baltimore (revision)	1:62500	20
Maryland–Pennsylvania–West Virginia:		
Frostburg	1:62500	20
West Virginia:		
Charleston (resurvey)	1:125000	100
Kentucky:		
Salyersville (resurvey)	1:125000	100
North Carolina:		
Pisgah (resurvey)	1:125000	100
Cranberry (resurvey)	1:125000	100
North Dakota:		
Pingree	1:125000	20
South Dakota:		
Canton	1:125000	20
Sturgis	1:62500	100

Topographic sheets completed in office, ready for engraving, during 1897–98—Continued.

State and sheet.	Scale.	Contour interval.
		Feet.
Minnesota:		
Tower	1:62500	20
Soudan	1:62500	20
Ely	1:62500	20
Fall Lake	1:62500	20
Minnesota–Wisconsin:		
St. Croix Falls	1:62500	20
Iowa–Wisconsin:		
Lancaster	1:125000	20
Illinois:		
Evanston	1:62500	10
Highwood	1:62500	10
Chicago (revision)	1:62500	10
Calumet (revision)	1:62500	10
Riverside (revision)	1:62500	10
Illinois–Indiana:		
Danville	1:62500	10
Indiana:		
Tolliston	1:62500	10
Nebraska:		
Chappell	1:125000	50
Ogallala	1:125000	50
Indian Territory:		
Antlers	1:125000	50
Canadian	1:125000	50
Claremore	1:125000	50
Coalgate	1:125000	50
McAlester	1:125000	50
Nowata	1:125000	50
Okmulgee	1:125000	50
Poteau	1:125000	50
Pryor Creek	1:125000	50
Sans Bois	1:125000	50
Vinita	1:125000	50
Wewoka	1:125000	50
Montana:		
Boulder	1:125000	100
Texas:		
Flatonia	1:125000	25
Utah:		
Tintic	1:62500	50
Idaho:		
Nampa (revision)	1:125000	100

Topographic sheets completed in office, ready for engraving, during 1897–98—Continued.

State and sheet.	Scale.	Contour interval.
		Feeet.
Washington:		
Snoqualmie	1:125000	100
California:		
Palo Alto	1:62500	25
San Jose	1:62500	25
Fernando	1:62500	50
Tujunga	1:62500	50
Riverside	1:62500	25
Mother Lode claim map (2 sheets)	1:63360	100

Mr. S. S. Gannett has, as heretofore, had charge of all the computing, including that pertaining to the astronomic work, base-line measurements, primary triangulation, and primary traverse. The results of this work are summarized and published in the Appendix, as is also a list of the permanent bench marks established by the spirit leveling.

Photolithography has been largely used for the purpose of transferring the field work to the final drawings. Formerly this was done by a tracing through a photograph of the field sheet, by which method some portion of the original expression was necessarily lost. Under the present system, by which a print from a negative reduced to the proper scale is made directly on a sheet of paragon paper, much time is saved and the result secured is much more faithful and satisfactory.

Mr. E. M. Douglas, while in the office, has had charge of the purchase and repair of all classes of instruments used in topographic work. In accordance with the plan approved in previous years, the repair work has been done by private contractors at stated prices for hours of labor, Mr. G. N. Saegmuller, of Washington, and Messrs. W. & L. E. Gurley, of Troy, New York, being the principal contractors. The minor repairs to woodwork were made by the carpenter of the Survey, Mr. N. L. King. A new graduated circle was made for one 8-inch micrometer theodolite. Figures were added for each degree to the circle of the 11-inch micrometer theodolite. One new 8-inch micrometer theodolite was purchased; so that

the Survey now owns eleven 8-inch micrometer theodolites and one 11-inch micrometer theodolite, all in good order. Three new telescopic alidades for general use and three transits of a special design for use in Alaska were purchased.

On account of the establishment of a more rigid system of accountability, the instruments came in from the field in better condition than ever before. With but few exceptions, no extensive repairs were needed to any one instrument, most of the repairs being small, such as come after the necessarily hard usage in a season of field work.

The systematic arrangement and cataloguing of the topographic records was continued during the year, under the general direction of Mr. H. M. Wilson, by Mr. S. A. Aplin, jr., custodian of topographic records, who was assisted by Mr. Joseph W. Kreuttner. In accordance with the plan described in the last annual report, the miscellaneous matter was completely carded. About 500 notebooks, including triangulation, topographic, and level records, containing the results of the last season's work, were cross indexed and filed. The field-sketch sheets and other related matter, other than notebooks, were filed in envelopes bearing the title of the atlas sheets, which were arranged in alphabetic order. There are about 1,000 of these envelopes, each containing all the material for the particular sheet, the number of pieces in an envelope in some cases being as high as 50.

Mr. Nathaniel Van Doren, Miss M. H. Corbett, Miss Mary Mitchell, and Miss Helen Fields have performed the necessary stenographic and typewriting work.

GEOGRAPHY AND FORESTRY SURVEY.

GEOGRAPHY.

Mr. Henry Gannett, as geographer of the Survey, continued in charge of the revision of the large map of the United States known as the "nine-sheet map."

He has compiled from all available sources a map of western United States showing, on a scale of 40 miles to the inch, the distribution of woodland and of what is thought to be merchantable timber. For most of this area the information

obtainable is amply accurate for this representation, consisting as it does of maps prepared by this organization and by the Hayden, Wheeler, and Powell surveys, together with much unpublished information.

In general geographic work there has been completed and published a folio on physiographic types, being folio 1 of the Topographic Atlas of the United States. A Gazetteer of Kansas, accompanied by a map of the State, on a scale of 1:750,000, in contours of 100 feet, has been completed, and is now in press as Bulletin No. 154. A revision of the Dictionary of Altitudes, the last edition of which was published in 1891, has been undertaken, and is far advanced toward completion.

FORESTRY.

This work has consisted principally in the superintendence of the examination of seven of the forest reserves established by order of President Cleveland February 22, 1897. The work was placed in charge of Mr. Gannett June 14, 1897, with the following instructions:

You are hereby assigned to the charge of an examination of the forests and woodland of the forest reserves and adjacent wooded regions. The allotment for this work will be $14,000.

You are authorized to employ assistants, who must be experts in the examination of forests, as hereafter set forth, at salaries not exceeding $125 per month and expenses. As topographic surveys will be in progress in each of the reserves to be examined, such experts may make their headquarters in the camps of the surveying parties, but should be prepared to make short trips independently in order to insure freedom in their work.

The topographers will outline all wooded areas upon the topographic maps. It will be the duty of the forestry experts to classify and map the areas occupied by timber suitable for the sawmill and for inferior uses, such as mining, railroad ties, and firewood. They will map also the distribution of the leading species of timber of economic value individually. They will make note, furthermore, of the size and density of the distribution of the valuable timber, and of the character and density of the undergrowth. They will map the area from which the timber has been destroyed, whether by burning, cutting, or other means, the extent to which the forests have been culled, and the species culled, the main purpose being to obtain an estimate of the value and character of the timber upon the reserves and adjacent regions. These experts should also make inquiries and be prepared to report upon the extent and character of the demand for timber, the means of getting it out, including the character of the streams, roads, railroads, etc.

Of the Black Hills of South Dakota a map has been prepared by the United States Geological Survey. For the examination of this area you will employ one such expert, and owing to the character of the country and the importance of the interests dependent upon it, great care should be exercised in his selection.

Of the Bighorn Reserve, in Wyoming, a small portion only has been mapped, but the remainder will be mapped during the coming year. For the examination of

this reserve you will employ one expert, who will use this map and tracings of the plane-table sheets of the remaining area as fast as they are prepared.

The Teton Reserve has been mapped by the Hayden Survey and the Uinta Reserve by the Powell and King surveys. For the examination of these reserves you will employ one expert, who will use these maps for the purpose.

The Priest River Reserve has been in part subdivided into townships, and the remainder will be subdivided similarly during the current season. For the examination of this reserve you will employ one expert, who will use the plats of the township exteriors for the purpose, thus defining areas by townships.

Work will be commenced upon the Bitterroot Reserve upon its eastern side, extending westward into it. For the examination of this reserve you will employ one expert, who will accompany the surveying party, using tracings of their plane-table sheets for his examinations.

In the Washington Reserve work will be commenced upon the east and west sides. One expert will be employed and accompany the surveying party, working upon the east side, using copies of the plane-table sheets as prepared; a second expert will be employed upon the west side of this reserve, and the same expert may make examinations in the Cascade Range to the southward, touching the question of the effect of sheep husbandry upon the forests.

You are authorized to make such journeys as may be necessary in carrying out these instructions, either by rail or by other mode of public or private conveyance, and to authorize the persons employed by you to make similar journeys.

Under the above instructions the following field assistants were employed: Mr. H. S. Graves, for the examination of the Black Hills; Mr. F. E. Town, for the Bighorn Reserve; Dr. T. S. Brandegee, for the Teton Reserve and the southern portion of the Yellowstone Reserve; Mr. J. B. Leiberg, for the Priest River Reserve and the eastern portion of the Bitterroot Reserve; Messrs. W. G. Steele and N. W. Gorman, for the eastern portion of the Washington Reserve, and Mr. H. B. Ayres for the western portion, the line of division between them being the summit of the Cascade divide.

The instructions given to these assistants by the geographer in charge differed somewhat in character, owing to differences in the conditions to be encountered, but the instructions given to Mr. Leiberg indicate the character of the information required, and a copy of them is here appended:

You have been temporarily transferred from the Department of Agriculture to the Geological Survey for the purpose of examining certain of the timber reserves created by Executive order of February 22. This work has been placed under my charge, and I inclose herewith instructions for your guidance.

The first reserve to be examined by you is that known as Priest River, limited on the east and west by the divides of the Priest Lake and River drainage basin, on the north by the international boundary, and on the south by the township lines between townships 56 and 57 north. Your examinations will not, however, be closely confined to these limits, but will extend a few miles east, west, and south of them, or as far as it may be convenient for you to obtain information.

The area is represented upon photographs of maps sent herewith. These were made by the survey of the international boundary between the Rocky Mountains

and the Pacific many years ago. I have no means of judging of their accuracy, but consider it probable that so far as the drainage and divides are concerned they may be of sufficient accuracy for the purpose. The contours upon them are sketchy and intended simply to show the degree of slope and the form of the topography. Maps on two scales are sent, the larger being 2 miles to an inch, the smaller 4 miles to an inch.

The information desired may be summarized as follows: The delimitation upon these maps of the wooded area and of the area occupied by merchantable timber. The amount of the latter expressed in feet, board measure, should be represented upon the map in grades as follows: (1) Under 2,000 feet per acre, (2) 2,000 to 5,000 feet per acre, (3) 5,000 to 10,000 feet per acre, (4) 10,000 to 25,000 feet per acre, (5) 25,000 to 50,000 feet per acre, (6) 50,000 to 100,000 feet per acre, (7) over 100,000 feet per acre. The areas occupied by the several grades should be marked by colored pencil.

I presume that in the Priest River Reserve you will find little, if any, timber of the lower grades. A little measurement and calculation will enable you to establish the limits of these grades, so that at sight you can throw an area into one or another of them.

All the above data may be represented upon one map, and the larger scale should be used. Upon other copies on the smaller scale you will represent the extent of each of the most valuable timber trees, such as western white pine, tamarack, cedar, and spruce.

Notes should be made, preferably upon maps, of the areas which have been cut over or culled, with a memorandum of the species cut; of areas burned over, with a memorandum of the damage inflicted.

Notes on the following subjects should accompany the maps above specified: The character of the soil; the forest litter; depth of the humus; the character and density of the underbrush and young growth; the range in size of the trees of the principal different species; the total height, clear trunk, and apparent age and soundness; the effect of fires on the reproduction of trees; the proportion of dead standing timber; the character of the cutting, by whom, and for what purpose; the means of transportation of lumber in and out of the reserve, streams, roads, etc.; the character and extent of the local demand for lumber; the effect of sheep pasturage on reserve; the use of water for irrigation and milling; the extent and distribution of land more valuable for agriculture than for timber.

As you will see on examining these instructions, they call for very nearly the same kind of information which you furnished in your report to Mr. Coville upon the Cœur d'Alene region, with one notable exception, which is, that such of the information as is areal in its character should be placed upon maps rather than in descriptive text.

Specimens of the vegetation should be collected and photographs taken for purposes of illustration.

Mr. Graves commenced work in the Black Hills early in July and finished in the latter part of November, having examined the entire timbered region of the hills, including much land outside the limits of the reserve. His report, which is very full and complete, is accompanied by maps prepared upon topographic sheets of the Survey as a base, on a scale of 1:125000.

Mr. Town commenced work in the Bighorn Mountains about the middle of July and ended near the close of September.

His report covers the entire area of the reserve, together with certain areas beyond it. A sketch map, prepared in part from the surveys made in the region by this organization and in part by compilation, has been provided for the illustration of this report.

Dr. Brandegee commenced work about the 1st of July and concluded the end of September, having examined the area of the Teton Reserve and that portion of the Yellowstone Reserve lying south of Yellowstone National Park. His report is well illustrated by maps, prepared upon the base furnished by the Hayden Survey for the Teton region and by maps of this Survey for the Yellowstone Reserve.

Mr. Leiberg commenced work in the Priest River Reserve July 1 and finished examination of that reserve in August. He has presented an exceptionally full and well-illustrated report upon it. Upon completion of the Priest River Reserve Mr. Leiberg commenced work on the Montana portion of the Bitterroot Reserve, and continued work there until driven out by approach of winter, after having mapped the Montana portion and a considerable area on the headwaters of the Clearwater and Salmon rivers. A report upon this region has been prepared.

In the Washington Reserve Messrs. Steele and Gorman commenced work about the middle of August and continued until the latter part of November, when they were driven out by bad weather. The examinations made upon this, the east side of the reserve, are not so full and complete as could be desired, but until detailed maps are available it does not seem advisable to carry the examinations any further.

Upon the west side Mr. Ayres commenced work about the middle of July and continued until the end of November, having completed this portion of the reserve. A map of this reserve has been prepared by compilation in the office from county maps and such work as was done by this organization during the last season, which will serve for present purposes.

Altogether an area estimated at 15,000 square miles of forest and woodland was examined by these special assistants during the last season, and with small exceptions all the nec-

essary items of information needed for intelligent administration have been collected.

Early in March Mr. Leiberg was ordered to southern California, and between March 8 and May 15 he examined the San Jacinto, San Bernardino, and San Gabriel reserves, and presented a preliminary report on them.

Mr. Gannett's movements during the season were directed toward familiarizing himself, so far as possible, with the areas and the forest conditions of the regions under examination. For this purpose he proceeded directly to the Pacific Coast in July and, after a short trip in the Mount Rainier Reserve, went up Lake Chelan to the upper waters of Stehekin River, in the Cascade Range. Here he spent a number of days before crossing the range. Going down to the coast by way of Cascade and Skagit rivers, he came east to the Black Hills. After visiting them, several days were spent in the examination of the Bighorn Mountains; then three days were devoted to the accessible portion of the Bitterroot Reserve, after which he returned to the Pacific Coast, reentering the Washington Reserve at Monte Cristo. Thence he proceeded to the San Jacinto Reserve, in southern California, and spent several days in the examination of that and the other reserves in that part of the State. On his way east a stop of several days was made at Las Vegas for the purpose of examining a proposed addition to that reserve in the neighborhood.

Reports on the examinations mentioned have been prepared and will be published as Part V of this Annual Report.

Besides the examination of forest reserves, many data have been collected concerning the density and distribution of forests in the West. The cruisings made under the direction of the State land office of Washington for the selection of lands, the cruisings made by the Northern Pacific Railway Company of its land grant in Washington, of the Oregon and California Railroad of its land in Oregon, of the Willamette Valley and Cascade Range wagon road in Oregon, and of several lumber companies have been collected. Of these the data furnished by the Northern Pacific Railway Company should be specially

mentioned, since their office has furnished not only the results of the cruisings of their lands, but has collected from other sources a vast deal of information, not only concerning the amount of timber, but concerning the areas which have been cut and those which have been burned. These data have been furnished in the form of accurate maps.

From the data thus obtained estimates, believed to be close approximations to the truth, have been made of the amount of standing timber in the States of Oregon and Washington. Moreover, the distribution of this timber has been mapped, both as to its total amount and as to the distribution of lumbermen's species. This, it is believed, is the first attempt made to obtain even an approximate idea of the amount of timber in the Northwest.

PUBLICATIONS BRANCH.

DIVISION OF ILLUSTRATIONS.

The Division of Illustrations remained in charge of Mr. De Lancey W. Gill, who was assisted throughout the year by Messrs. John L. Ridgway, Daniel W. Cronin, H. Hobart Nichols, H. Chadwick Hunter, F. W. von Dachenhausen, and John H. Pellen. Dr. J. C. McConnell and Miss Frances Wieser were employed temporarily at different periods during the year.

Drawings to the number of 2,079 were prepared, described as follows: Geologic landscapes, 13; geologic and topographic maps, 139; geologic sections and diagrams, 482; paleontologic drawings, 816; photographs retouched, 160; miscellaneous drawings, 469.

Drawings to be used as illustrations for two volumes of the Eighteenth Annual Report, ten bulletins, and one monograph were transmitted to the Public Printer. These drawings were marked for reproduction by the following processes, in many cases with superior results: Lithography, 53; line engraving, 300; half-tone engraving, 248; photo-gelatin, 6.

The printed editions of all chromolithographic work delivered at the Government Printing Office for Survey publica-

tions were examined by this division. Proofs of 1,374 illustrations were received and carefully criticised during the year.

PHOTOGRAPHIC LABORATORY.

The photographic laboratory has been, as in previous years, in charge of Mr. J. K. Hillers, assisted by Messrs. C. C. Jones, John Erbach, Charles A. Ross, and Nelson H. Kent, photographic printers.

Following is a tabular statement of the work done by the laboratory during the year:

Photographic negatives, prints, etc., made during 1897–98.

Month.	Negatives.	Prints.	Slides.	Transparencies.	Prints mounted.
1897.					
July	248	1,036	196	.....	.....
August	274	1,006	68	.....	.....
September	270	711	22	.....	.....
October	773	1,142	146	.....	.....
November	261	1,435	150	.....	.....
December	263	1,314	198	.....	.....
1898.					
January	195	1,206	202	.....	204
February	161	1,217	172	.....	97
March	174	1,109	112	40 × 50—1	.....
April	107	613	18	.....	.....
May	104	1,150	37	.....	.....
June	222	744	.....	28 × 34—8 22 × 28—8	65
Total	3,052	12,683	1,321	17	366

EDITORIAL DIVISION.

TEXTUAL PUBLICATIONS.

Mr. Philip C. Warman remained in charge of this section. He was assisted throughout the year by Mr. George M. Wood, and by Mrs. A. B. Wood until her resignation, March 31, 1898.

As during previous years, the work progressed in a highly satisfactory manner, and at the close of the fiscal year was

well in hand. Following are lists of the manuscripts prepared for the printer and the proofs read and corrected during the year:

Manuscripts edited during the year 1897–98.

Publication.	Pages.
Eighteenth Annual Report (in part)	2,598
Nineteenth Annual Report (in part)	3,052
Monograph XXXV	375
Bulletin No. 39	199
Bulletin No. 150	862
Bulletin No. 151	158
Bulletin No. 152 (catalogue slips)	3,577
Bulletin No. 153	1,952
Bulletin No. 154	596
Bulletin No. 155	121
Water-Supply Paper No. 12	106
Water-Supply Paper No. 13	113
Water-Supply Paper No. 14	140
Water-Supply Paper No. 15	220
Water-Supply Paper No. 16	213
Water-Supply Paper, unnumbered	99
Geologic folios 37, 38, 39, 40, 41, 42, 43, and one unnumbered folio (western Massachusetts)	605
Topographic folio 1, Physiographic Types	46
Report on Potomac drainage basin (Senate Doc. No. 90)	163
Text for brochure, Map of Alaska	81
Total number of manuscript pages edited	15,276

Proof sheets read during the year 1897–98.

Publication.	Pages.
Eighteenth Annual Report (in part)	4,069
Nineteenth Annual Report (in part)	298
Monograph XXIX	841
Monograph XXX	210
Bulletins 88, 89, 150, 151, 152, 153, 154, 155	1,942
Water-Supply Papers 7, 8, 9, 10, 11, 12, 13, 14, 15, 16	829
Text for geologic folios 36, 37, 38, 39, 40, 41, 42, 43	49
Topographic folio 1, Physiographic Types	4
Report on Potomac drainage basin (Senate Doc. No. 90)	64
Text for brochure, Map of Alaska	44
Total number of printed pages read	8,350

The reading of the above involved the handling of proofs of 2,679 galleys and 14,888 pages. During the year indexes were prepared for nearly all the publications above named.

GEOLOGIC MAPS.

This section was in charge of Mr. Bailey Willis during July and a part of August. On August 12 Mr. George W. Stose was appointed editor of geologic maps, and has since discharged the duties of that position. In this capacity he examined original maps and sections submitted by the geologists for publication as folios, and read proof of the same while they were in the process of engraving and printing. The descriptive texts of the folios have been edited by Mr. Willis and Mr. Warman jointly. Mr. Willis has also given advice in the preparation of color schemes for the folios and concerning other important matters of editing.

Mr. O. A. Ljungstedt was employed chiefly in the preparation of sections for the folios from the authors' rough drafts, and in general drafting work. He devoted some time to the preparation of topographic maps shaded to bring out relief, with a view to introducing this method of illustration on the topographic sheets of the folios. He also assisted in the reading of geologic proof. Mr. H. S. Selden was employed mainly in compiling a base map of Texas for use in a physiographic folio of that State. He was also engaged in other drafting work and in proof reading.

During the year the following folios of the Geologic Atlas of the United States were transmitted by the geologists and accepted for publication:

Absaroka, Wyoming.
Big Trees, California.
Bristol, West Virginia.
Elmore, Colorado.
Fort Benton, Montana.
La Plata, Colorado.
Little Belt Mountains, Montana.
Monterey, Virginia and West Virginia.
Raleigh, West Virginia.
Roseburg, Oregon.
Standingstone, Tennessee.
Tacoma, Washington.
Telluride, Colorado.

Eight folios were brought to completion during the year, Nos. 36 to 43, inclusive. These are embraced in the following list, which is complete to date:

Geologic folios published.

No.	Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
1	Livingston	Montana	110°–111°	45°–46°	3,354	25
2	Ringgold	Georgia, Tennessee	85°–85° 30′	34° 30′–35°	980	25
3	Placerville	California	120° 30′–121°	38° 30′–39°	932	25
4	Kingston	Tennessee	84° 30′–85°	35° 30′–36°	969	25
5	Sacramento	California	121°–121° 30′	38° 30′–39°	932	25
6	Chattanooga	Tennessee	85°–85° 30′	35°–35° 30′	975	25
7	Pikes Peak *a*	Colorado	105°–105° 30′	38° 30′–39°	932	25
8	Sewanee	Tennessee	85° 30′–86°	35°–35° 30′	975	25
9	Anthracite-Crested Butte	Colorado	106° 45′–107° 15′	38° 45′–39°	465	50
10	Harpers Ferry	Virginia, West Virginia, Maryland	77° 30′–78°	39°–39° 30′	925	25
11	Jackson	California	120° 30′–121°	38°–38° 30′	938	25
12	Estillville	Virginia, Kentucky, Tennessee	82° 30′–83°	36° 30′–37°	957	25
13	Fredericksburg	Maryland, Virginia	77°–77° 30′	38°–38° 30′	938	25
14	Staunton	Virginia, West Virginia	79°–79° 30′	38°–38° 30′	938	25
15	Lassen Peak	California	121°–122°	40°–41°	3,634	25
16	Knoxville	Tennessee, North Carolina	83° 30′–84°	35° 30′–36°	969	25
17	Marysville	California	121° 30′–122°	39°–39° 30′	925	25
18	Smartsville	California	121°–121° 30′	39°–39° 30′	925	25
19	Stevenson	Alabama, Georgia, Tennessee	85° 30′–86°	34° 30′–35°	980	25
20	Cleveland	Tennessee	84° 30′–85°	35°–35° 30′	975	25
21	Pikeville	Tennessee	85°–85° 30′	35° 30′–36°	969	25
22	McMinnville	Tennessee	85° 30′–86°	35° 30′–36°	969	25
23	Nomini	Maryland, Virginia	76° 30′–77°	38°–38° 30′	938	25
24	Three Forks	Montana	111°–112°	45°–46°	3,354	50
25	Loudon	Tennessee	84°–84° 30′	35° 30′–36°	969	25
26	Pocahontas	Virginia, West Virginia	81°–81° 30′	37°–37° 30′	950	25
27	Morristown	Tennessee	83°–83° 30′	36°–36° 30′	963	25
28	Piedmont	Virginia, Maryland, West Virginia	79°–79° 30′	39°–39° 30′	925	25
29	Nevada City:					
	Nevada City	California	121° 00′ 25″–121° 03′ 45″	39° 13′ 50″–39° 17′ 16″	11.65	50
	Grass Valley		121° 01′ 35″–121° 05′ 04″	39° 10′ 22″–39° 13′ 50″	12.09	
	Banner Hill		120° 57′ 05″–121° 00′ 25″	39° 13′ 50″–39° 17′ 16″	11.65	
30	Yellowstone National Park:					
	Gallatin	Wyoming	110°–111°	44°–45°	3,412	75
	Canyon					
	Shoshone					
	Lake					

a Out of stock.

Geologic folios published—Continued.

No.	Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
31	Pyramid Peak.	California.....	120°–120° 30′	38° 30′–39°	932	25
32	Franklin	Virginia..... West Virginia	79°–79° 30′	38° 30′–39°	932	25
33	Briceville.....	Tennessee	84°–84° 30′	36′–36° 30′	963	25
34	Buckhannon...	West Virginia	80°–80° 30′	38° 30′–39°	932	25
35	Gadsden.....	Alabama.....	86°–86° 30′	34°–34° 30′	986	25
36	Pueblo	Colorado.....	104° 30′–105°	38°–38° 30′	938	50
37	Downieville ...	California	120° 30′–121°	39° 30′–40°	919	25
38	Butte Special..	Montana.....	112° 29′ 30″–112° 36′ 42″	45° 59′ 28″–46° 02′ 54″	22.80	50
39	Truckee	California.....	120°–120° 30′	39°–39° 30′	925	25
40	Wartburg	Tennessee	84° 30′–85°	36°–36° 30′	963	25
41	Sonora.....	California	120°–120° 30′	37° 30′–38°	944	25
42	Nueces	Texas	100°–100° 30′	29° 30′–30°	1,035	25
43	Bidwell Bar ...	California	121°–121° 30′	39° 30′–40°	919	25

The Pueblo folio contains eight sheets of illustrations, two of which are special representations of structural and economic features. One is a reproduction of a relief model showing the geologic structure of the area, and the other is a shaded map in colors showing artesian-water conditions throughout the quadrangle. The Butte Special map is a double sheet, twice the folio size. The illustration of special geologic and topographic features by half-tone engravings of photographs taken in the field has been more generally introduced in the later folios.

The following folios are now in hand, at various stages of the processes of engraving and printing:

Geologic folios in process of engraving and printing.

Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
Big Trees.....	California	120°–120° 30′	38°–38° 30′	938	25
Boise	Idaho.....	116°–116° 30′	43° 30′–44°	864	25
Fort Benton....	Montana.....	110°–111°	47°–48°	3,234	25
Holyoke.....	Massachusetts	72° 30′–73°	42°–42° 30′	885	50
Little Belt Mountains.	Montana.....	110°–111°	46°–47°	3,295	25
London.....	Kentucky	84°–84° 30′	37°–37° 30′	950	25
Richmond	Kentucky	84°–84° 30′	37° 30′–38°	944	25
Roseburg.....	Oregon	123°–123° 30′	43°–43° 30′	871	25
Tazewell	Virginia..... West Virginia.	81° 30′–82°	37°–37° 30′	950	25
Telluride	Colorado.....	107° 45′–108°	37° 45′–38°	236	25
Ten mile District	Colorado.....	106° 08′–106° 16′ 08″	39° 22′ 57″–39° 30′ 25″	62.2	25

TOPOGRAPHIC MAPS.

At the beginning of the fiscal year 1897–98 Mr. Bailey Willis was acting editor of topographic maps, in place of Mr. Marcus Baker, who for some time previous had, at the request of the United States Commission on the Veñezuela-British Guiana Boundary, been engaged in assisting in its work. Mr. Baker returned to full duty in the Geological Survey, as cartographer, on July 1, 1897, and on August 1 resumed the duties of editor of topographic maps, which he thenceforth continued to perform throughout the year, assisted by Messrs. James McCormick, H. W. Elmore, and William Stranahan, and for a short time by Mr. H. S. Selden. Mr. Baker has also continued to serve as secretary of the United States Board on Geographic Names and to perform various miscellaneous duties, more especially relating to Alaskan matters and to map publication.

Topographic atlas sheets, as received from the Topographic Branch of the Survey, go to the editor of topographic maps. Under his supervision they are carefully examined and revised before approval for engraving, and later the proofs are read and corrected. The original manuscript maps are in the custody of the editor of topographic maps, and during the year a card catalogue of them was prepared.

On July 1, 1897, there were on hand 111 unpublished manuscript topographic atlas sheets. Of these some were in various stages of engraving, while work upon others was not yet begun. In addition to these, 40 new sheets were received during the year, making a total of 151. These 151 sheets are listed below, in four groups.

Group I, containing 66 sheets, comprises those whose engraving was completed during the year and which were approved for printing.

Group II comprises those sheets which are in process of engraving at the close of the year.

Group III comprises those sheets which have been edited and approved for engraving.

Group IV comprises those sheets which are not yet approved for engraving.

GROUP I.—*Topographic atlas sheets engraved and printed (or approved for printing) during the fiscal year 1897–98.*

Quadrangle and State.	Position of SE. corner.				Contour interval.	Scale.
	Latitude.		Longitude.			
	°	′	°	′	*Feet.*	
Albion, New York	43	00 N	78	00 W	20	1:62500
Amelia, Virginia (*a*)	37	00	77	30	50	1:125000
Apishapa, Colorado (*a*)	37	30	104	00	25	1:125000
Arroyo Grande, California	35	00	120	30	50	1:62500
Austin, Texas (*a*)	30	00	97	30	25	1:125000
Bennington, Vermont	42	45	73	00	20	1:62500
Bristol, Virginia–Tennessee (revision)	36	30	82	00	100	1:125000
Camp Clarke, Nebraska	41	30	103	00	20	1:125000
Cayucos, California	35	15	120	45	50	1:62500
Choptank, Maryland	38	30	76	00	20	1:125000
Concord, California	37	45	122	00	25	1:62500
Coos Bay, Oregon	43	00	124	00	100	1:125000
Cowee, North Carolina–South Carolina (*a*)	35	00	83	00	100	1:125000
Dardanelles, California	38	00	119	30	100	1:125000
Durango, Colorado	37	15	107	45	100	1:62500
Eagle Mountain, Texas	30	30	105	00	100	1:125000
Ellijay, Georgia–North Carolina–Tennessee (*a*)	34	30	84	00	100	1:125000
Elmoro, Colorado (*a*)	37	00	104	00	25	1:125000
Grand Island, Nebraska	40	30	98	00	20	1:125000
Hailey, Idaho	43	30	114	00	100	1:125000
Hartville, Wyoming	42	00	104	30	50	1:125000
Hoosick, New York–Vermont	42	45	73	15	20	1:62500
Hot Springs Special Map, Arkansas	.....		.....		20	1:62500
Kanawha Falls, West Virginia (*a*)	38	00	81	00	100	1:125000
Karquines, California	38	00	122	00	25	1:62500
Keene, New Hampshire–Vermont	42	45	72	15	20	1:62500
La Plata, Colorado	37	15	108	00	100	1:62500
Lincoln, Nebraska	40	30	96	30	20	1:125000
Lockport, New York	43	00	78	30	20	1:62500
Maynardville, Tennessee (*a*)	36	00	83	30	100	1:125000
Medina, New York	43	00	78	15	20	1:62500
Monadnock, New Hampshire	42	45	72	00	20	1:62500
Mount Diablo, California	37	45	121	45	50	1:62500
Mount Hamilton, California	37	15	121	30	50	1:62500

a Resurvey.

GROUP I.—*Topographic atlas sheets engraved and printed (or approved for printing) during the fiscal year 1897–98*—Continued.

Quadrangle and State.	Position of SE. corner.		Contour interval.	Scale.
	Latitude.	Longitude.		
	° ′	° ′	*Feet.*	
Newcomb, New York	43 45 N	74 00 W	20	1:62500
North Creek, New York	43 30	73 45	20	1:62500
Oak Orchard, New York	43 15	78 00	20	1:62500
Olcott, New York	43 15	78 30	20	1:62500
Olean, New York	42 00	78 15	20	1:62500
Olivet, South Dakota	43 00	97 30	20	1:125000
Omaha and vicinity, Nebraska–Iowa			20	1:62500
Palo Alto, California	37 15	122 00	25	1:62500
Paradox Lake, New York	43 45	73 30	20	1:62500
Parker, South Dakota	43 00	97 00	20	1:125000
Patrick, Wyoming-Nebraska	42 00	104 00	20	1:125000
Port Harford, California	35 00	120 45	50	1:62500
Portland, Oregon–Washington	45 30	122 30	25	1:62500
Raleigh, West Virginia (*a*)	37 30	81 00	100	1:125000
Ridgeway, New York	43 15	78 15	20	1:62500
San Jose, California	37 15	121 45	25	1:62500
San Luis Obispo, California	35 15	120 30	50	1:62500
Schroon Lake, New York	43 45	73 45	20	1:62500
Scotts Bluff, Nebraska	41 30	103 30	20	1:125000
Seattle, Washington	47 30	122 00	50	1:125000
Shasta Special Map, California			100	1:62500
Somerville, New Jersey (*b*)	40 30	74 30	20	1:62500
Spanish Peaks, Colorado (*a*, *c*)	37 00	104 30	100	1:125000
Standingstone, Tennessee	36 00	85 00	100	1:125000
Tacoma, Washington	47 00	122 00	50	1:125000
Thirteenth Lake, New York	43 30	74 00	20	1:62500
Utica, New York	43 00	75 00	20	1:62500
Uvalde, Texas	29 00	99 30	25	1:125000
Walsenburg, Colorado (*a*)	37 30	104 30	50	1:125000
Washington, District of Columbia–Maryland–Virginia (*b*, *d*)	38 45	76 45	20	1:62500
Weiser, Idaho	44 00	116 30	100	1:125000
Yosemite, California	37 30	119 30	100	1:125000
Geologic Map of Alaska				

a Resurvey. *b* Reengraved. *c* Formerly called Trinidad. *d* Revised.

GROUP II.—*Topographic atlas sheets sent to engraver and not yet approved for printing.*

Cottonwood Falls, Kansas.
Dunlap, Illinois.*a*
Elkton, Maryland-Pennsylvania-Delaware.
Frostburg, Maryland-West Virginia-Pennsylvania.
Haywards, California.
Hebron, Nebraska.
Hempstead, New York.
Housatonic, Massachusetts-Connecticut-New York.
Huron, South Dakota.
McAlester, Indian Territory.
Mount Stuart, Washington.
Nampa, Idaho-Oregon.*a*
Oceana, West Virginia-Virginia-Kentucky.*b*
Oyster Bay, New York-Connecticut.
Patuxent, Maryland-District of Columbia.
Rome, Georgia-Alabama.*b*
St. Mary, Maryland.
Salyersville, Kentucky.*b*
Sturgis, South Dakota.
Sundance, Wyoming.
Superior, Nebraska.
Tintic Mining Map, Utah.
Tintic Special Sheet, Utah.
Tolchester, Maryland.
York, Nebraska.

GROUP III.—*Manuscript topographic atlas sheets examined and approved for engraving.*

Alexandria, South Dakota.
Anamosa, Iowa.*c*
Auburn, New York.
Brockport, New York.
Brookwood, Alabama.
Browns Creek, Nebraska.
Canadian, Indian Territory.
Charleston, West Virginia.*b*
Clinton, Iowa-Illinois.*c*
Crystal Falls, Michigan.
David City, Nebraska.
Deming, New Mexico.
De Smet, South Dakota.
Desoto, Missouri.
Dover, Maryland-Delaware-New Jersey.
Ellendale, North and South Dakota.
Goshen Hole, Wyoming-Nebraska.
Hamlin, New York.
Iron River, Michigan-Wisconsin.
Loup, Nebraska.
Maquoketa, Iowa-Illinois.*c*
Mitchell, South Dakota.
Moravia, New York.
Northville, South Dakota.
Okmulgee, Indian Territory.
Pingree, North Dakota.
Pisgah, North Carolina-South Carolina.*b*
Redfield, South Dakota.
Sagola, Michigan.
Ste. Genevieve, Missouri-Illinois.
St. Paul, Nebraska.
Sawtooth, Idaho.
Sidney, Nebraska.
Skaneateles, New York.
Vineland, New Jersey-Delaware.
Wahoo, Nebraska.
Whistle Creek, Nebraska.
Witbeck, Michigan.

GROUP IV.—*New topographic atlas sheets awaiting editorial examination before approval for engraving.*

Boulder, Montana.
Canton, South Dakota-Iowa.
Cazenovia, New York.
Chappell, Nebraska.
Danville, Illinois-Indiana.
Evanston, Illinois.
Fernando, California.
Highwood, Illinois.
Indian Lake, New York.
Lancaster, New Hampshire-Vermont.
Lancaster, Wisconsin-Iowa-Illinois.
Ogalalla, Nebraska.
Peterboro, New Hampshire.
Redlands, California. *b*
Remsen, New York.
Riverside, California.
Salamanca, New York.
Tolleston, Indiana.
Tujunga, California.
Tully, New York.
Mother Lode district, California, claim map (2 sheets).

a Redrawn. *b* Resurvey. *c* Additional field work to be done before engraving.

List of topographic atlas sheets revised, corrected, and approved for new editions during the year 1897–98.

Albany, New York.
Atlantic City, New Jersey.
Berlin, New York-Massachusetts-Vermont.
Becket, Massachusetts.
Big Trees, California.
Boothbay, Maine.
Butte Special Map, Montana.
Caldwell, Kansas
Cambridge, New York.
Chester, Pennsylvania-New Jersey-Delaware.
Chittenango, New York.
Colfax, California.
Donaldsonville, Louisiana.
Fonda, New York.
Fort Ann, New York.
Fort Benton, Montana.
Franklin, New Jersey.
Glassboro, New Jersey.
Hackettstown, New Jersey.
Hammonton, New Jersey.
High Bridge, New Jersey.
Holyoke, Massachusetts-Connecticut.
Lake Hopatcong, New Jersey.
Little Belt Mountains, Montana.
Marlboro, Massachusetts.
Monterey, Virginia-West Virginia.
Morristown, New Jersey.
Mount Holly, New Jersey.
Mullica, New Jersey.
Norfolk, Virginia.
Oriskany, New York.
Palmyra, Virginia.
Pemberton, New Jersey.
Philadelphia, Pennsylvania-New Jersey.
Pittsfield, Massachusetts-New York.
Port Henry, New York-Vermont.
Salem, New Jersey-Delaware.
Sandisfield, Massachusetts-Connecticut.
Sheffield, Massachusetts-Connecticut-New York.
Silver City, Idaho.
Sonora, California.
Sun Prairie, Wisconsin.
Tenmile District, Colorado.
Truckee, California.
Wartburg, Tennessee.
Nine-sheet map of the United States.

DIVISION OF ENGRAVING AND PRINTING.

Mr. S J. Kübel was continued in charge of this division as chief engraver, assisted by Mr. Henry C. Evans, foreman of copperplate engravers; Mr. Robert H. Payne, in charge of the transferring to stone; Mr. Joseph F. Eckert, in charge of the work of the lithographic power presses; and Mr. Oscar Schleichert, in charge of the stonework. There were also employed 19 copperplate engravers, 5 lithographic engravers, and 37 printers, printers' assistants, and laborers.

The work of the division has been, as in previous years, devoted to the engraving and printing of topographic maps and geologic folios. The photolithographic branch established in 1897 has expedited work on manuscript maps being prepared for engraving purposes. The greater portion of the energy of this photolithographic section was given to the production of township plats of the surveys in the Indian Territory.

Topographic sheets.—New sheets to the number of 58 were engraved during the year, distributed by States as follows: Arkansas, 1; California, 10; Colorado, 2; Georgia, 1; Idaho,

2; Indian Territory, 1; Kansas, 1; Maryland, 2; Maryland–Pennsylvania–Delaware, 1; Maryland–Virginia–District of Columbia, 2; Massachusetts, 1; Nebraska, 3; Nebraska–Iowa, 1; New Hampshire, 2; New Jersey, 1; New York, 10; North Carolina–South Carolina, 1; Oregon, 2; South Dakota, 2; Tennessee, 3; Texas, 2; Utah, 2; Vermont, 1; Virginia, 1; Washington, 2; Wyoming–South Dakota, 1.

Of the standard topographic atlas sheets, there were printed and delivered during the year a total of 389,922 copies of 239 sheets, being more than three times as many as were printed during the previous year; and of miscellaneous material there were printed 70,427 pieces.

The first number of a projected series of topographic folios has been issued. This folio is entitled Physiographic Types, and consists of four pages of text and ten maps. It is bound similarly to the geologic folios, and the edition was 5,000.

Geologic folios.—The rate of production of geologic folios has not increased over that of last year. This is due partly to the very greatly increased amount of work gradually entering into the make-up of these folios, and partly to the rapidly increasing amount of corrective revision on topographic atlas sheets. There is on hand, however, a large lot of advance work on geologic folios awaiting the completion of companion sheets, etc. Altogether there are fourteen folios in hand, in various stages of advancement, and they will be issued one after another in rapid succession. Lists of the geologic folios published during the year and those in an advanced stage have been given under the heading "Geologic maps" (pp. 130–132). The total number of copies of geologic folios printed and delivered was 23,741.

An incident in the work of this division was the engraving and printing of a map of Alaska. A special appropriation of $2,500 was made for this work, and under it 42,000 copies of the text and map (in four colors) were printed and bound in paper covers.

In April Mr. Kübel was made chairman of a Committee on Map Editing and Printing. Many of the questions which come before this committee are highly important and their consideration requires much time.

During the year Mr. Kübel visited the large engraving and printing establishments in Germany and made a special study of the processes of reproduction of maps and photolithography there employed.

The standard of work in the division has been not only sustained but improved along some lines.

ADMINISTRATIVE BRANCH.

DIVISION OF DOCUMENTS, CORRESPONDENCE, AND RECORDS.

This division was continued in general charge of the chief clerk, Col. H. C. Rizer, the custody and distribution of the documents and stationery being under the immediate charge of Dr. W. D. Wirt, and the files and records of correspondence and appointments in charge of Mr. John R. Walsh.

DOCUMENTS AND STATIONERY.

The distribution of documents during the year has increased somewhat over that of last year, 128,454 volumes, 21,026 geologic folios, and 151,950 maps having been sent out, including those distributed under Congressional enactments. The postal authorities handled this large amount of material promptly and without the loss of a single important piece.

The publications received and distributed were Parts I, IV, V, and V (continued) of the Eighteenth Annual Report, and separates therefrom; Bulletins Nos. 87, 88, and 149; Monograph XXVIII and Atlas; Water-Supply and Irrigation Papers Nos. 2 to 16, inclusive; Map of Alaska, with accompanying text; Geologic folios 33, 34, 36, 37, 38, 39, 40, 41; and 232 separate map sheets, including reissues.

The proceeds from the sale of publications amounted to $4,148.95, of which $2,817.05 was received for topographic maps.

During the year 420 requisitions for stationery and supplies were made upon the Department, and about 2,412 office requisitions were filled. Letters relating to documents, stationery, etc., to the number of 26,662 were received and 24,978 were sent out.

CORRESPONDENCE AND RECORDS.

The register of letters of a general character received shows that 4,100 communications were briefed, indexed, and appropriately referred for action. The record of letters sent aggregates nearly 4,000 pages of typewritten material.

The keeping of the detailed records of appointments and of leaves of absence and attendance consumes much time, involving considerable Departmental correspondence, many specific reports, numerous entries, etc.

In addition to the customary routine, copy was prepared for the Biennial Register (Blue Book) and for the Register of the Department.

The changes in official personnel were as follows: Regular appointments, 23; limited appointments, 40; promotions, 86; resignations, 15; transfers, 5; reinstatements, 2.

Miss Annie L. Arnold, assistant, rendered efficient service throughout the year.

THE LIBRARY.

The library of the Survey was continued under the charge of Mr. Charles C. Darwin, assisted by Miss Julia L. McCord, Miss M. E. Latimer, and Mr. Thomas K. Gallaher.

The addition to the library during the year consists of 1,363 books, 3,700 pamphlets, and 800 maps; a total of 5,863. Of these, 884 books, 3,000 pamphlets, and over 700 maps were received in exchange for Survey publications.

CONTENTS OF THE LIBRARY JUNE 30, 1898.

BOOKS.

On hand June 30, 1897:			
Received by exchange	29,681		
Received by purchase	11,231		
		40,912	
Received during the past year:			
By exchange	949		
By purchase	484		
		1,433	
			42,345

PAMPHLETS.

On hand June 30, 1897:			
Received by exchange	52,079		
Received by purchase	13,061		
		65,140	
Received during the past year:			
By exchange	3,000		
By purchase	700		
		3,700	
			68,840

CONTENTS OF THE LIBRARY JUNE 30, 1898—Continued.

MAPS.

Geologic and topographic maps:		
On hand June 30, 1897	27,085	
Received during the year	800	
		27,885
		139,070

DIVISION OF DISBURSEMENTS AND ACCOUNTS.

This division remained in charge of Mr. John D. McChesney, chief disbursing clerk, throughout the year. Mr. McChesney has occupied this position in the Survey since its organization, in 1879. The excellence of his methods and the efficiency of the division have recently been affirmed by special agents of the Treasury Department, who, under the provisions of an act of Congress approved February 19, 1897, were detailed by the Auditor for the Interior Department, with the approval of the Secretary of the Treasury and of the Secretary of the Interior, to investigate the accounts and the disbursing and accounting system of the Geological Survey.

A summarized statement of disbursements follows, and a detailed statement is preserved in the office.

FINANCIAL STATEMENT.

Amounts appropriated for and expended by the United States Geological Survey for the fiscal year ending June 30, 1898.

	Geological Survey, 1898.	Geological Survey, 1897 and 1898.	Surveying lands in the Indian Territory, 1897 and 1898.	Resurveying Chickasaw lands, 1897 and 1898.	Surveying forest reserves.	Engraving and printing the geological maps of the U. S., 1898.
Appropriations 1897 and 1898, and 1898: Acts approved February 19, 1897; June 4, 1897; June 7, 1897; January 20, 1898; January 28, 1898; and from other sources	$156,726.60	$275,000.00	$130,000.00	$141,500.00	$150,000.00	$60,139.27
Amounts expended, classified as follows:						
A. Services	119,130.61	181,407.07	91,160.70	77,937.22	75,333.87	47,882.45
B. Traveling expenses	4,871.83	17,210.50	461.75	756.79	6,154.99	24.85
C. Transportation of property	351.21	2,080.11	731.60	612.21	2,839.87	20.40
D. Field subsistence	5,028.28	25,046.18	20,043.32	20,254.79	12,041.79	.....
E. Field supplies and expenses	3,521.42	21,488.48	13,093.16	10,021.53	12,999.28	.....
F. Field material	1,564.19	7,068.12	1,720.30	2,107.05	11,139.81	.....
G. Instruments	1,564.83	3,518.12	675.60	683.72	2,940.85	.....
H. Laboratory material	620.44	.....	.....	.....	.....	.....
I. Photographic material	2,311.35	767.34	.....	.....	822.18	.....
K. Books and maps, etc	4,155.21	536.25	.....	.....	5.00	.....
L. Stationery and drawing material	105.36	757.52	572.62	213.45	131.18	.....
M. Illustrations for reports	1,135.00	41.63	.....	.....	19.50	.....
N. Office rents	4,199.88	10.00	321.00	300.00	.....	.....
O. Office furniture	144.50	48.00	.....	.....	151.00	.....
P. Office supplies and repairs	760.08	980.73	271.79	149.21	269.65	666.93
Q. Storage	2.60	482.86	22.25	.....	155.23	.....
R. Correspondence	97.98	186.32	25.04	3.97	176.58	1.10
S. Materials for engraving and printing maps	.....	.....	.....	.....	.....	10,115.19
T. Railroad accounts settled at U. S. Treasury:						
Passenger	376.04	1,620.46	.....	.....	745.07	.....
Freight	53.61	408.07	.....	.....	476.04	.....
Total expenditures	149,994.42	264,557.76	129,099.13	113,099.94	126,401.89	58,710.92
Balance unexpended July 1, 1898	6,732.18	10,442.24	900.87	28,400.06	23,598.11	1,428.35
Probable amount required to meet outstanding liabilities	6,732.18	10,442.24	900.87	28,400.06	23,598.11	1,428.35

Amounts appropriated for and expended by the United States Geological Survey for the fiscal year ending June 30, 1898—Continued.

	Salaries, office of Geological Survey, 1898.	Boundary line between Idaho and Montana, 1897 and 1898.	Preparation of map of Alaska, 1898.	Geological and topographical surveys in Alaska, 1898 and 1899.	Total.
Appropriations 1897 and 1898, and 1898: *Acts* approved February 19, 1897; June 4, 1897; June 7, 1897; January 20, 1898; January 28, 1898; and from other sources	$31,390.00	$7,650.00	$2,500.00	$20,000.00	$974,905.87
Amounts expended, classified as follows:					
A. Services	31,158.75	1,298.47	1,172.85	1,249.52	627,731.51
B. Traveling expenses		128.19		1,657.20	31,266.10
C. Transportation of property		83.57		155.13	7,774.10
D. Field subsistence		387.41			82,801.77
E. Field supplies and expenses		712.30		523.59	62,359.76
F. Field material		723.24		302.40	24,685.11
G. Instruments		255.00			9,638.12
H. Laboratory material					620.44
I. Photographic material				87.45	3,988.32
K. Books and maps, etc					4,696.46
L. Stationery and drawing material				78.04	1,858.17
M. Illustrations for reports					1,196.13
N. Office rents					4,830.88
O. Office furniture					343.50
P. Office supplies and repairs		.30	50.00	57.75	3,206.44
Q. Storage		30.75			693.69
R. Correspondence		4.64			495.63
S. Materials for engraving and printing maps			1,203.04		11,318.23
T. Railroad accounts settled at U. S. Treasury:					
Passenger				705.50	3,447.07
Freight					937.72
Total expenditures	31,158.75	3,623.87	2,425.89	4,816.58	883,889.15
Balance unexpended July 1, 1898	231.25	4,026.13	74.11	15,183.42	91,016.72
Probable amount required to meet outstanding liabilities		4,026.13		15,183.42	90,711.36

ANALYSIS OF DISBURSEMENTS.

Under the following heads appear the total expenditures under the various appropriations:

1. Salaries, office of Geological Survey	$31,158.75
2. Salaries of scientific assistants	29,900.00
3. Skilled laborers and various temporary employees	12,995.31
4. Topography	167,631.21
5. Geology	96,926.55
6. Paleontology	9,341.18
7. Chemical and physical researches	6,507.66
8. Preparation of illustrations	12,991.25
9. Mineral resources of the United States	19,937.95
10. Books for library, etc	4,209.03
11. Gauging streams, etc	44,922.68
12. Rent of office rooms	4,199.88
13. Coal and gold resources of Alaska	4,989.48
14. Engraving and printing geological maps of the United States	58,710.92
15. Surveying lands in the Indian Territory	129,099.13
16. Resurveying Chickasaw lands	113,099.94
17. Surveying forest reserves	126,401.89
18. Boundary line between Idaho and Montana	3,623.87
19. Preparation of map of Alaska	2,425.89
20. Geological and topographical surveys in Alaska	4,816.58
Total	883,889.15

APPENDIX TO NINETEENTH ANNUAL REPORT OF THE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY

TRIANGULATION AND SPIRIT LEVELING

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APPENDIX TO DIRECTOR'S REPORT: TRIANGULATION AND SPIRIT LEVELING.

The data included in this appendix have been assembled for publication by Messrs. H. M. Wilson, J. H. Renshawe, E. M. Douglas, and R. U. Goode, chiefs of the Atlantic, Central, Rocky Mountain, and Pacific sections of topography.

TRIANGULATION.

The topographic work and the survey of forest reserves rendered necessary the establishment of two astronomic stations and four base lines; 204 primary and 30 secondary triangulation stations were occupied, and 314 miles of primary traverse were run, the total area controlled by triangulation and traverse being 55,900 square miles. Some of the results of the season's work, although complete within themselves, are not now published because it is expected that during the field season of 1898 the work will be extended and connections will be made with new astronomic stations and base lines, which will give data for adjustment of station errors. For this reason the positions of 21 new stations in Texas, 30 in Wyoming, and 23 in Montana which were determined are omitted from the following lists. The distribution of the work is shown on Pl. II, in pocket. The geographic positions derived from completed work are given on the following pages:

Summary of published results, 1897–98: Astronomy, triangulation, primary traverse, and meridian marks.

Locality.	Astronomic stations.	Triangulation stations.	Traverse stations.	Meridian marks.
New York		8		
Maryland				1
Illinois			12	
Missouri			84	3
Nebraska		9		1
South Dakota and Wyoming		9		2
Colorado				2
Texas				3
Utah		9		7
Oregon	1	6		1
Southern California		11		1
Montana and Idaho	1	19		1
Montana and Idaho boundary		9		
Total	2	80	96	22

ASTRONOMIC WORK.

The methods adopted in the astronomic determinations of latitude and longitude were the same as those described in some detail in the preceding report;[1] that is, latitudes were determined by the Talcott or zenith distance method, and longitudes by the telegraphic method, the base station being the Washington Observatory, St. Louis, Missouri.

The adopted longitude west of Greenwich of the base station has been changed, however, from $6^h\ 00^m\ 49^s.168$, as reported in 1896, to $6^h\ 00^m\ 49^s.261$. This change arises from a readjustment of the longitude net of the United States and its connection with that of Greenwich by the United States Coast and Geodetic Survey.[2] Hence all longitudes dependent upon the Washington Observatory, St. Louis, hitherto published in the bulletins and reports of the United States Geological Survey should be increased by 0.093 seconds of time or 1.40 seconds of arc.

The corresponding correction to all longitudes dependent upon the Lafayette Park Observatory, San Francisco, California, is +.091 seconds of time or +1.37 seconds of arc, and the correction to those depending upon Spokane, Washington, is +.141 seconds of time or +2.11 seconds of arc.

BASE LINES.

The base lines were measured with 300-foot steel tapes, as described in last year's report.[3] The accuracy of measurement by this method is amply sufficient for the necessities of triangulation for geographic mapping.

TRIANGULATION AND PRIMARY TRAVERSE.

The field work of the triangulation and primary traverse was carried on in accordance with the instructions published in the appendix to the report for 1896–97.[4] In cases where the office computation of primary work showed an average triangle closure error larger than 5″, the stations will be reoccupied and additional measures of angles obtained, so that no triangle in a primary scheme will have an error in excess of the adopted limit.

MERIDIAN LINES.

Two marks, generally on a true north-south line, were established at each county seat falling within the area under survey. In a few cases it was impracticable to place the marks on north-south lines; the variations from such lines were then given in figures stamped on one or both of the station marks. Meridian lines were located in public grounds whenever possible, usually on ground connected with a county

[1] Eighteenth Ann. Rept. U. S. Geol. Survey, Part I, 1897, pp. 143–144.
[2] See Appendix No. 2, Report of the United States Coast and Geodetic Survey for 1897.
[3] Eighteenth Ann. Rept. U. S. Geol. Survey, Part I, 1897, p. 144.
[4] Ibid., pp. 145–148.

court-house. Observations were made either with the large astronomic transit during longitude work or with 8-inch micrometer theodolites on Polaris near elongation.

DESCRIPTIONS AND POSITIONS OF STATIONS, ARRANGED BY STATES.

NEW YORK.

The positions of the following six stations in the southwest portion of the Adirondack region were determined by Mr. W. J. Peters from Penn and Hamilton stations of the United States Coast and Geodetic Survey, and from Starr, Schuyler, and Barto stations of the New York State Survey. The positions of the stations in Cattaraugus County are derived from Learn and Clarksville of the work of 1896.

WEST CREEK, HAMILTON COUNTY.

The station is on the northwest end of a narrow ridge about one-half mile in length in the southern part of the county, and about 3 miles west of Parleys, on Oregon-Pisico Lake road.

Station mark: Copper bolt in solid rock, marked "U. S. G. S. N. Y. 486."

[Latitude, 43° 17′ 55″.25. Longitude, 74° 41′ 29″.32.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Schuyler	66 25 45	246 08 31	4.57643
Pen	101 13 36	280 50 11	4.671912
Hamilton	244 24 35	64 37 58	4.464888
Fish	224 12 42	44 22 14	4.42900
Cold Brook	80 00 51	259 48 45	4.41872

WEST CANADA, HAMILTON COUNTY.

A timbered summit about 3,000 feet altitude, 4 miles due east of Forest Lodge, in the Adirondack League Preserve, in Township 7.

Station mark: Copper bolt in solid rock, marked "U. S. G. S. N. Y. 483," over which is built a small mound of stone. There are two reference arrows cut in rock outcroppings.

[Latitude, 43° 31′ 25″.80. Longitude, 74° 43′ 30″.97.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hamilton	293 07 42.24	113 22 30.27	4.4994236
Snowy	234 12 50.71	54 26 50.28	4.5263101
Little Moose	217 26 46.51	37 33 09.72	4.3112380
Cloud Cap	239 00 11.70	59 10 15.00	4.35938
Pen	69 52 17.88	249 30 13.72	4.6642805

LITTLE MOOSE, HAMILTON COUNTY.

Also known as Kismeth. Is a cleared mountain summit near the headwaters of West Canada, Cedar, and South Branch of Moose rivers, in Township 4.

Station mark: A copper bolt, marked "U. S. G. S. N. Y. 484."

[Latitude, 43° 40′ 12″.16. Longitude, 74° 34′ 15″.27.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hamilton	330 02 15.89	150 10 42.30	4.5200577
West Canada	37 33 09.72	217 26 46.51	4.3112380

BARTO, HERKIMER COUNTY.

A New York State Survey station on a bare hill in Fairfield Township, about 1½ miles east of village of Fairfield.

Station mark: A stone post marked "N. Y. S. S. 28."

[Latitude, 43° 07′ 50″.07. Longitude, 74° 53′ 24″.38.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cold Brook	145 25 54.00	325 20 59.00	4.23313
Schuyler	100 53 00.31	280 43 43.13	4.2728459

SCHUYLER, HERKIMER COUNTY.

A New York State Survey station in lot 16, Schuyler Township, about 6 miles from Poland, on the old Poland-Utica stage road.

Station mark: Granite post marked "N. Y. S. S. 203."

[Latitude, 43° 09′ 43″.95. Longitude, 75° 06′ 59″.13.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cold Brook	219 22 03.00	39 26 26.00	4.13584
Myers	182 07 13.00	2 07 53.00	4.54513
West Creek	246 08 31.00	66 25 45.00	4.57643
Penn	154 16 17.00	334 10 19.29	4.4284693
West Canada	218 09 22.00	38 25 27.00	4.7091616
Fort Noble	220 34 40.00	40 46 41.00	4.56094
Barto	280 43 43.13	100 53 00.31	4.2728459

PENN, ONEIDA COUNTY.

A United States Coast and Geodetic Survey point on a bare hill about 2 miles west of Steuben station, in Steuben Township.

Station mark: A granite post marked $\frac{U\,S}{G|S}$, with four granite witness posts.

[Latitude, 43° 22′ 46″.56. Longitude, 75° 15′ 36″.36.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
West Creek	280 50 11.00	101 13 37.00	4.67194
Schuyler	334 10 19.29	154 16 17.00	4.4284693
West Canada	249 30 13.72	69 52 17.88	4.6642805
Fort Noble	264 17 01.00	84 34 59.00	4.55002
Hamilton	266 52 46.87	87 29 36.54	4.8601480

FLATIRON, CATTARAUGUS COUNTY.

Locally known as Flatiron Rock. This station is in Olean Township, and is 3 miles south of Olean, on the northeast end of a high ridge forming the divide between Napp Creek and Allegany River.

Station mark: Copper bolt in solid rock, marked "U. S. G. S. N. Y. 479."

[Latitude, 42° 01′ 37″.26. Longitude, 78° 26′ 40″.19.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Clarksville	247 40 24.7	67 50 19.9	4.3437861
Learn	182 36 45.9	2 37 17.0	4.3683237
Townsend	117 33 42.7	297 23 25.2	4.3779127

TOWNSEND, CATTARAUGUS COUNTY.

Locally known as Townsends Hill. The station is in Salamanca Township, about 3 miles southeast of Salamanca. There is a private road from the village of Salamanca to the station.

Station mark: Iron post marked "U. S. Geological Survey B. M. 480."

[Latitude, 42° 07′ 34″.25. Longitude, 78° 42′ 01″.62.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Learn	240 54 26.5	61 05 16.4	4.4047580
Flatiron	297 23 25.2	117 33 42.7	4.3779127

MARYLAND.

CUMBERLAND, ALLEGANY COUNTY; MERIDIAN MARKS.

The south mark is a bronze tablet set in the top of the old bridge pier in the park. The north mark is 350 feet from the south mark and is a bronze tablet set in a marble post 4 feet in length and 8 inches square.

ILLINOIS.

The following geographic positions were determined by Mr. George T. Hawkins by primary traverse between Lake Survey triangulation station Fairmount and the Indiana-Illinois State line. Traverse follows the Wabash Railroad:

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Fairmount triangulation station	40 01 35.8	87 50 48.8
Fairmount depot	40 02 48.6	87 49 54.2
Junction Wabash and Chicago and Eastern Illinois railroads	40 02 57.2	87 48 22.4
Catlin depot	40 03 45.3	87 42 13.9
Permanent bench mark at Catlin	40 03 53.8	87 42 02.8
¼ corner secs. 24, 25, T. 19 N., R. 12 W.	40 05 12.8	87 40 03.4
Crossing at Tilton	40 05 54.4	87 38 53.4
Junction Wabash and Chicago and Eastern Illinois railroads	40 06 04.4	87 38 37.8
Danville, Wabash depot	40 07 30.7	87 37 31.2
Junction Wabash and "Big 4" railroads	40 08 09.0	87 37 05.0
Corner secs. 26, 27, 34, 35, T. 20 N., R. 11 W.	40 09 40.3	87 35 01.1
Crossing of Wabash Railroad and Indiana-Illinois State line	40 11 51.6	87 31 51.0

MISSOURI.

The following geographic positions were determined by Mr. George T. Hawkins by primary traverse between United States Coast and Geodetic Survey station Lynch (near Pacific) and the astronomic pier of the United States Geological Survey at Springfield. Traverse follows the St. Louis and San Francisco Railroad:

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Lynch triangulation station	38 24 32.1	90 44 00.0
¼ corner secs. 35, 36, T. 43 N., R. 2 E.	38 25 30.2	90 45 21.2
Catawissa depot	38 25 34.6	90 46 57.0
Moselle depot	38 23 17.0	90 53 49.9

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
¼ corner secs. 16, 21, T. 42 N., R. 1 E.	38 22 34.4	90 55 05.6
Corner secs. 19, 30, T. 42 N., R. 1 E., on fifth meridian	38 21 47.0	90 57 59.5
St. Clair depot	38 20 53.5	90 58 50.1
¼ corner secs. 9, 16, T. 41 N., R. 1 W.	38 18 20.4	91 02 09.4
Anaconda depot	38 18 10.9	91 02 25.1
Stanton depot	38 16 35.2	91 06 18.8
Corner secs. 23, 24, 25, 26, T. 41 N., R. 2 W.	38 16 16.5	91 06 24.5
Corner secs. 3, 4, 9, 10, T. 40 N., R. 2 W.	38 13 28.3	91 08 46.0
Sullivan depot	38 12 38.7	91 09 39.8
Corner secs. 8, 9, 16, 17, T. 40 N., R. 2 W.	38 12 33.8	91 09 51.8
Bourbon depot	38 09 14.7	91 14 43.9
Sec. corner 1,050 feet north of Coffeyton depot.	38 07 17.6	91 16 24.9
Coffeyton depot	38 07 08.6	91 16 28.3
Corner secs. 18, 19 on range line, T. 39 N., R. 4 W.	38 05 31.8	91 18 00.7
Leasburg depot	38 05 31.3	91 17 53.4
Range line between 3 and 4 W., T. 39 N.	.....	91 18 00.1
Corner secs. 15, 16, 21, 22, T. 39 N., R. 4 W.	38 05 36.4	91 21 51.8
Corner secs. 29, 30, 31, 32, T. 39 N., R. 4 W.	38 03 53.8	91 23 35.5
Cuba depot	38 03 50.3	91 23 58.9
Corner secs. 3, 4, 9, 10, T. 38 N., R. 5 W.	38 02 09.1	91 28 14.2
¼ corner secs. 7, 12, T. 38 N., R. 5 and 6 W.	38 01 53.4	91 31 35.4
Knobview depot	38 01 50.8	91 31 40.6
St. James depot	37 59 53.7	91 36 56.9
Corner secs. 19, 20, 29, 30, T. 38 N., R. 6 W.	37 59 36.4	91 37 05.7
Corner secs. 25, 26, 35, 36, T. 38 N., R. 7 W.	37 58 46.9	91 39 07.1
Dillon depot	37 58 24.0	91 41 55.5
¼ corner between secs. 31, 36, T. 37 N., R. 7 and 8 W	37 58 27.5	91 44 56.3
Rolla depot	37 57 05.2	91 46 14.7
Corner 600 feet south of railroad, 1¼ miles west of Rolla	37 56 02.8	91 48 16.4
Newburg depot	37 54 47.2	91 54 08.7
¼ corner secs. 20, 21, T. 37 N., R. 9 W.	37 54 56.4	91 56 02.1
Arlington depot	37 55 16.8	91 58 18.7
Jerome depot	37 55 39.1	91 58 39.2
Corner secs. 11, 12, 13, 14, T. 37 N., R. 10 W.	37 56 20.0	91 59 08.1
Corner secs. 4, 5, 8, 9, T. 37 N., R. 10 W.	37 57 13.6	92 02 24.1
Franks depot	37 57 21.7	92 02 24.6
¼ corner secs. 25, 26, T. 38 N., R. 11 W.	37 59 30.5	92 05 40.4
Dixon depot	37 59 31.8	92 05 51.3
Hancock depot	37 59 13.2	92 10 54.7
¼ corner secs. 35, 36, T. 38 N., R. 11 W.	37 58 51.3	92 11 11.4
¼ corner secs. 8, 9, T. 37 N., R. 12 W.	37 57 08.4	92 15 41.5

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Crocker depot	37 56 59.6	92 15 50.6
Range line between 12 and 13 W., T. 37 N		92 17 57.3
Swedeborg depot	37 54 52.6	92 19 57.8
Corner secs. 22, 23, 26, 27, T. 37 N., R. 13 W	37 55 04.7	92 20 09.2
Corner secs. 7, 8, 17, 18, T. 36 N., R. 13 W	37 51 37.0	92 23 32.4
Richland depot	37 51 30.0	92 24 26.4
Northeast corner sec. 29, T. 36 N., R. 14 W	37 49 58.5	92 29 04.8
Southland depot	37 48 57.2	92 30 40.2
Range line between 14, 15 W., T. 36 N		92 31 23.4
Corner secs. 10, 11, 14, 15, T. 35 N., R. 15 W	37 46 31.4	92 33 38.5
Sleeper depot	37 45 41.4	92 35 39.2
¼ corner secs. 31, 36, T. 34 N., R. 15 and 16 W	37 43 58.4	92 37 56.6
Lebanon depot	37 40 48.7	92 39 54.8
¼ corner secs. 10, 11, T. 34, R. 16 W	37 40 40.3	92 40 05.1
Corner secs. 20, 21, 28, 29, T. 34 N., R. 16 W	37 38 42.8	92 42 12.2
Brush Creek depot	37 37 01.0	92 42 56.0
Southeast corner sec. 15, T. 33 N., R. 17 W	37 34 14.0	92 46 48.5
Phillipsburg depot	37 33 15.2	92 47 10.6
¼ corner secs. 8, 9, T. 32 N., R. 17 W	37 30 21.5	92 48 59.3
Conway depot	37 30 07.3	92 49 19.8
Corner secs. 17, 18, 19, 20, T. 32 N., R. 17 W	37 29 03.4	92 50 06.4
Corner secs. 17, 18, 19, 20, T. 31 N., R. 17 W	37 23 23.6	92 50 15.9
Niangua depot	37 23 20.1	92 50 02.4
Corner secs. 2, 3, 10, 11, T. 30 N., R. 18 W	37 20 24.3	92 53 42.6
Marshfield depot	37 20 14.3	92 54 23.0
Corner secs. 7, 8, 17, 18, T. 30 N., R. 18 W	37 19 39.3	92 56 24.0
Northview depot	37 17 15.1	92 59 54.7
Corner secs. 22, 23, 26, 27, T. 30 N., R. 19 W	37 17 54.9	93 00 17.3
North corner secs. 3, 4, T. 29 N., R. 20 W	37 16 16.8	93 07 07.8
Strafford depot	37 16 08.1	93 07 08.6
¼ corner secs. 3, 10, T. 29 N., R. 20 W	37 14 21.4	93 13 02.2
Springfield astronomic pier	37 13 16.0	93 17 17.6

MARSHFIELD, WEBSTER COUNTY; MERIDIAN MARKS.

The meridian line is on the east side of a north-south street in the southeastern part of the town, and is marked by iron bench-mark posts set about 1,000 feet apart.

LEBANON, LACLEDE COUNTY; MERIDIAN MARKS.

The meridian line, about 1,800 feet in length, is in the western part of the town, the north end being in the grounds connected with the public school and the south end being in an inclosed building lot. Each end is marked by an iron bench-mark post.

ROLLA, PHELPS COUNTY; MERIDIAN MARKS.

The meridian line, about 600 feet in length, is located along a north-south fence across the road from the School of Mines. Each end is marked by an iron bench-mark post.

Positions determined by Mr. George T. Hawkins by a primary traverse across country from Winfield, a station of the Mississippi River Commission, to the fifth principal meridian, 1¼ miles east of Troy.

Position.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Winfield station	38 59 12.4	90 44 19.2
¼ corner between secs. 22 and 23, T. 49 N., R. 2 E	38 59 38.5	90 45 51.9
Corner secs. 20, 21, 28, 29, T. 49 N., R. 2 E.	38 59 12.9	90 48 08.5
Range line between R. 1 and 2 E., T. 49 N., at Chantilla	38 59 49.2	90 50 32.1
Corner secs. 13, 14, 23, 24, T. 49 N., R. 1 E.	39 00 09.1	90 51 40.7
Fifth principal meridian, 1¼ miles east of Troy, where it crosses Troy and Winfield wagon road	38 58 38.4	90 57 21.2
Northwest corner sec. 30, T. 49 N., R. 1 E.	38 59 20.0	90 57 21.2

SOUTH DAKOTA AND WYOMING.

During October, November, and December, 1897, Mr. Frank Tweedy extended triangulation westward from Bradley, Harney, Custer, and Bear Butte stations of the 1893 survey. The work was done with 8-inch Fauth micrometer theodolite. During a portion of the time the weather was extremely cold, stormy, and windy, and the observations were not always good. The error of closure was about 5″.

BEAR SPRINGS, CUSTER COUNTY, SOUTH DAKOTA.

Timbered ridge about 1½ miles northeast of Bear Springs. Abrupt slope on east; gentle slope on west. The station is on highest point of ridge, which is heavily timbered.

Station mark: Copper bolt in large limestone rock set in the ground.

[Latitude, 43° 52′ 13″.56. Longitude, 103° 44′ 13″.13.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sullivan	34 09 53.98	313 59 10.19	4.5705439
Elk	57 31 06.66	237 18 24.23	4.4657756
Crow Nest	139 39 23.34	319 30 17.45	4.4322164
Custer	180 58 38.38	360 59 00.42	4.6191289
Harney	271 22 48.96	91 31 39.68	4.2331457
Bradley	349 10 40.60	169 15 34.71	4.7080511

LOOKOUT, LAWRENCE COUNTY, SOUTH DAKOTA.

Partially timbered, rock-capped butte 2 miles east of Spearfish. A road to rock quarry runs from Spearfish to Bluff near top of butte on southeast side.

Station mark: Copper bolt in rock set level with surface.

[Latitude, 44° 29′ 36″.33. Longitude, 103° 49′ 42″.20.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Terry	0 05 39.93	180 05 38.97	4.2632770
Crow Peak	76 07 27.58	256 02 05.88	4.0192695
Bear Butte	273 12 55.19	93 30 07.59	4.5134020

TERRY, LAWRENCE COUNTY, SOUTH DAKOTA.

A well-known peak and one of the highest points in the Black Hills, about 1½ miles southwest of Portland Station on the Burlington and Missouri Railroad between Deadwood and Spearfish. Easily reached from Portland Station.

Station mark: Copper bolt in a rock wedged between pieces of bed rock. Large cairn of rock placed over bolt and around target pole.

[Latitude, 44° 19′ 42″.32. Longitude, 103° 49′ 43″.56.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Crow Peak	147 24 35.05	327 19 14.76	4.2738275
Lookout	180 05 38.97	0 05 39.93	4.2632770
Bear Butte	243 08 29.36	63 25 41.19	4.5626941
Custer	319 05 59.62	139 10 12.67	4.0892617
Harney	334 28 43.74	154 41 26.62	4.7544872

CROW NEST, PENNINGTON COUNTY, SOUTH DAKOTA.

Three-fourths of a mile east of road from Newcastle to Deadwood, and 2½ miles south of where branch of same road turns east down canyon of Castle Creek.

Station mark: Copper bolt in quartzite rock set in the ground.

[Latitude, 40° 03′ 20″.98. Longitude, 103° 57′ 19″.91.

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Custer	220 49 38.90	40 59 09.20	4.4438517
Harney	301 07 50.22	121 25 48.01	4.6074830
Bear Spring	319 30 17.15	139 39 23.34	4.4322164

CROW PEAK, LAWRENCE COUNTY, SOUTH DAKOTA.

High peak, 5 miles south of west of Spearfish at head of Higgins Gulch. Heavily timbered on south and west.

Station mark: Brass wedge set in Portland cement in rock placed in the ground.

Latitude, 44° 28′ 14″.85. Longitude, 103° 57′ 21″.35.

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lookout	256 02 05.88	76 07 27.60	4.0192695
Bear Butte	269 00 05.92	89 22 39.78	4.6305955
Terry	327 19 14.76	147 24 35.05	4.2738275

SULLIVAN, CUSTER COUNTY, SOUTH DAKOTA.

On the southern portion of Elk Mountain Range, on flat bare end of ridge, 3 miles northwest of Sullivan Spring. The ridge is steep and rocky on the east side and gently sloping with heavy timber on the west side.

Station mark: Copper bolt in soft sandstone bed rock.

[Latitude, 43° 35′ 35″.28. Longitude, 103° 59′ 44″.43.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Alkali	97 18 01.49	276 57 58.09	4.5957651
Newcastle	147 43 04.51	327 32 24.27	4.5884282
Elk	165 48 43.09	345 46 45.55	4.1916530
Bear Springs	213 59 10.19	34 09 53.98	4.5705439
Harney	231 11 04.76	51 30 37.92	4.6869700
Bradley	302 15 28.19	122 31 02.68	4.5576334

ELK, CUSTER COUNTY, SOUTH DAKOTA.

On extreme north end of Elk Mountain Range, 1½ miles northwest of Smith Ranch and about one-fourth mile east of Wyoming–South Dakota boundary line. Abrupt timbered slopes on west and north. The station is heavily timbered, and considerable cutting was done to obtain necessary sights.

Station mark: Copper bolt in quartzite bed rock.

[Latitude, 43° 43′ 43″.64. Longitude, 104° 02′ 34″.69.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Alkali	74 03 12.25	253 45 04.95	4.5646742
Newcastle	136 18 12.67	316 09 28.49	4.3885760
Bear Spring	237 18 24.23	57 31 06.66	4.4657756
Sullivan	345 46 45.55	165 48 43.09	4.1916530

DEADWOOD, LAWRENCE COUNTY, SOUTH DAKOTA; MERIDIAN MARKS.

The south mark is a bronze tablet cemented in a white sandstone post, 8 inches square and 2½ feet long, projecting 8 inches above the ground. The post is located near the north bend of Red Creek, about 100 feet south of Main street extended and one-eighth of a mile above the planing mill. The north mark is a cross cut on a copper bolt set in a sandstone post, 8 inches square and 2½ feet long, projecting 6 inches above the ground, located on the north edge of the road just west of Mrs. Livingston's cabin, about 500 feet north of the south mark.

NEWCASTLE, WESTON COUNTY, WYOMING.

On a grassy ridge 3½ miles northwest of Newcastle and one-half mile southeast of Kilpatrick Brothers' ranch.

Station mark: Copper bolt in bed-rock limestone.

[Latitude, 43° 53′ 16″.11. Longitude, 104° 15′ 11″.90.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Alkali	33 21 34.37	213 12 09.22	4.5225376
Elk	316 09 28.49	136 18 12.67	4.3885760
Sullivan	327 32 24.27	147 43 05.51	4.5884282

ALKALI, WESTON COUNTY, WYOMING.

On a butte about 22 miles west of south from Newcastle, Wyoming, at heads of Muskrat, Robbers Roost, and Alkali creeks. It is the most prominent butte within 30 miles, and is well known. The surrounding country is treeless and barren.

Station mark: Copper bolt in quartzite bed rock. Stone cairn 5 feet high over bolt.

[Latitude, 43° 38′ 13″.98. Longitude, 104° 28′ 48″.97.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Newcastle	213 12 09.22	33 21 34.37	4.5225376
Elk	253 45 04 95	74 03 12.25	4.5646742
Sullivan	276 57 58.09	97 18 01.49	4.5957651

NEBRASKA.

Triangulation based upon secondary points of the Missouri River Commission, Schmidt and Pit, was expanded southeastward by Mr. George T. Hawkins, to control two atlas sheets only.

The average closure error of the triangles is 7″.5, which is considered sufficiently accurate, this being secondary work for the control of a small area.

SCOTT, CEDAR COUNTY.

In southeast ¼ sec. 34, T. 29 N., R. 3 E., 7 miles east and 1 mile north of Coleridge, about 15 miles southeast of Hartington.

Station mark: An iron post with brass cap marked "U. S. Geological Survey."

[Latitude, 42° 31′ 21″.53. Longitude, 97° 03′ 19″.67.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Coleridge	83 58 34.43	263 50 27.00	4.2190419
Cedar	109 51 59.89	289 41 28.25	4.3548988
Cook	177 07 26.27	357 07 05.98	4.1340787

COOK, CEDAR COUNTY.

Ten miles east and 2 miles north of Hartington, in sec. 22, T. 31 N., R. 3 E., on top of ridge east of Bow Creek.

Station mark: An iron post with brass cap marked "U. S. Geological Survey."

[Latitude, 42° 38′ 42″.28. Longitude, 97° 03′ 49″.67.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Scott	357 07 05.98	177 07 26.27	4.1340787
Coleridge	45 49 03.10	225 41 15.39	4.3425992
Cedar	74 00 20.71	253 50 08.65	4.3312216
Schmidt	129 07 04.53	308 57 14.40	4.4483105

COLERIDGE, CEDAR COUNTY.

In sec. 7, T. 29 N., R. 2 E., about 2 miles west of the town of Coleridge and 7½ miles nearly south of Hartington.

Station mark: An iron post with brass cap marked "U. S. Geological Survey."

[Latitude, 42° 30′ 24″.58. Longitude, 97° 15′ 20″.96.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Havens	94 01 26.35	273 52 59.31	4.2347882
Cedar	152 46 04.76	332 43 40.97	4.0250934
Cook	225 41 15.39	45 49 03.10	4.3425992
Scott	263 50 27.00	83 58 34.43	4.2190419

CEDAR, CEDAR COUNTY.

In sec. 9, T. 30 N., R. 1 E., 2½ miles west and 2½ miles south of Hartington, on prominent hill at the end of a high ridge.

Station mark: An iron post with brass cap marked "U. S. Geological Survey."

[Latitude, 42° 35′ 29″.83. Longitude, 97° 18′ 53″.60.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Schmidt	177 00 12.17	356 59 35.26	4.3739282
Cook	253 50 08.65	74 00 20.71	4.3312216
Scott	289 41 28.25	109 51 59.89	4.3548989
Coleridge	332 43 40.97	152 46 04.76	4.0250934
Havens	56 10 38.56	236 04 34.91	4.1695262
Bow	120 03 48.78	299 58 12.47	4.1163353
Gable	144 33 53.09	324 28 38.74	4.2601770

SCHMIDT, CEDAR COUNTY.

On first high ground east of Mr. Schmidt's house, which is 5½ miles southeast of ferry landing opposite Yankton, South Dakota. The station is in sec. 29, T. 33 N., R. 1 E., and is one of the Missouri River Commission secondary points.

Station mark: A piece of gas pipe with small triangle in the cast-iron cap.

[Latitude, 42° 48′ 15″.38. Longitude, 97° 19′ 48″.03.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Pit	87 10 21.79	267 02 43.29	4.1862446
Gable	46 39 29.85	226 34 51.82	4.1075505
Cedar	356 59 35.26	177 00 12.17	4.3739282
Cook	308 57 15.40	129 08 04.53	4.4483105

GABLE, CEDAR COUNTY.

On highest point of ridge, in sec. 28, T. 32 N., R. 1 W., 9 miles south and 3 miles west of Yankton, South Dakota; 3 miles east, one-half mile south, of Crofton.

Station mark: An iron post with brass cap marked "U. S. Geological Survey."

[Latitude, 42° 43′ 30″.25. Longitude, 97° 26′ 37″.49.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Schmidt	226 34 51.82	46 39 29.85	4.1075505
Cedar	324 28 38.74	144 33 53.09	4.2601770
Bow	5 08 42.74	185 08 20.53	3.9200530
Pit	143 04 54.49	323 01 54.32	4.0017181

BOW, CEDAR COUNTY.

On mound-shaped hill on top of ridge between Bow and Beaver creeks, in NW. ¼ sec. 20, T. 31 N., R. 1 W., 10 miles west and 2 miles north of Hartington.

Station mark: An iron post with brass cap marked "U. S. Geological Survey."

[Latitude, 42° 39′ 01″.75. Longitude, 97° 27′ 10″.25.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Pit	162 02 34.81	341 59 57.01	4.2341736
Gable	185 08 20.53	5 08 42.74	3.9200530
Cedar	299 58 12.47	120 03 48.78	4.1163353
Havens	3 37 46.97	183 37 19.19	4.1703727

HAVENS, CEDAR COUNTY.

In cultivated field on hill, in sec. 5, T. 29 N., R. 1 W., one-half mile south of Havens post-office.

Station mark: An iron post with brass cap marked "U. S. Geological Survey."

[Latitude, 42° 31′ 02″.95. Longitude, 97° 27′ 51″.31.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Bow	183 37 19.19	3 37 46.97	4.1703727
Cedar	236 04 34.91	56 10 38.56	4.1695262
Coleridge	273 52 59.31	94 01 26.35	4.2347882

PIT, KNOX COUNTY.

On mound-shaped hill in NW. ¼ sec. 35, T. 33 N., R. 2 W. It is six miles southwest of Aten, and 4 miles north and 1 mile west of Crofton.

This station is one of the Missouri River Commission secondary points. The original gas-pipe station mark has been destroyed. Instrument was mounted over the point where the mark is said to have been.

Station mark: An iron post with brass cap marked "U. S. Geological Survey."

[Latitude, 42° 47′ 50″.29. Longitude, 97° 31′ 02″.84.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Schmidt	267 02 43.29	87 10 21.79	4.1862446
Gable	323 01 54.32	143 04 54.49	4.0017181
Bow	341 59 57.01	162 02 34.81	4.2341736

HARTINGTON, CEDAR COUNTY.

The meridian line, 600 feet in length, is in the fair grounds, and each end is marked by an iron bench-mark post.

COLORADO.

DENVER, ARAPAHOE COUNTY; MERIDIAN MARKS.

The meridian line is located on the east side of the Capitol grounds, and is 412 feet in length. The south mark is an aluminum tablet, cemented in a gray granite post set 4 feet in the ground and projecting about 3 inches above the sod. It is 41.67 feet west of the curbing between the street and sidewalk and a few feet southwest of the top step at the southeast entrance of the grounds. The north mark is a bronze tablet set in the northwest end of the top step at the northeast corner of the grounds. It is 41.54 feet west of the line of curbing between the sidewalk and street on Grant avenue.

BOULDER, BOULDER COUNTY; MERIDIAN MARKS.

This meridian line is located in the grounds connected with the University of Colorado. The south mark is about 12 feet west and north of the southeast corner of the grounds, and the north mark is in the obtuse angle formed by the east line and the railroad right of way, each mark being a bronze tablet cemented in a sandstone post 4½ feet in length, set so as to project 6 inches above the surface of the ground.

TEXAS.

BASTROP, BASTROP COUNTY; MERIDIAN MARKS.

The meridian marks are located in the eastern part of the court-house square, and approximately 350 feet distant from each other, both ends being dressed limestone posts 6 by 8 inches on top and 4 feet in length, set 3 feet in the ground. The posts are set about 3 feet inside the north-south lines of the fence and about 100 feet from the east line, the exact point in each case being marked by the cross on the bronze tablet set in top of posts.

GONZALES, GONZALES COUNTY; MERIDIAN MARKS.

This meridian line is located in the eastern part of the court-house square, and approximately 240 feet in length. Both ends are marked by dressed-stone posts 10 inches square and 4 feet 6 inches long, set 3 feet 4 inches in the ground, and in the top of each post a bronze tablet is cemented. Owing to the square being laid off at a considerable angle with the meridian, the line runs diagonally across the square. The south mark is nearly in the center of the south side of the square and about 4 feet inside the present fence line. The north mark is about 20 feet from the northeast corner of the square and 4 feet inside the fence.

SEGUIN, GUADALUPE COUNTY; MERIDIAN MARKS.

This meridian line is located in the western part of the court-house square. The line is 200 feet in length, being the extreme length of the side of the square. Both ends of the line are marked by split-sandstone posts 8 by 10 inches square and 4 feet in length, set 3 feet in the ground. A bronze tablet is cemented in the top of each post. The posts are set about 3 feet inside of the stone base of the north-south lines of the iron fence around the square and about 30 feet from the west line, the exact point in each case being the cross mark on the bronze tablet.

MONTANA AND IDAHO.

The triangulation for the Bitterroot Forest Reserve, in Montana and Idaho, depends upon an astronomic station at Hamilton, Montana, and upon a base line, 5.3 miles in length, measured along the branch of the Northern Pacific Railroad passing through Hamilton.

This base was expanded to the highest summits of the range on the western side of the Bitterroot Valley by Mr. S. S. Gannett, the average closure error of 20 triangles in the expansion being 2″.0. From these stations a reconnaissance triangulation was extended over the whole of the forest reserve by Mr. J. B. Lippincott, using a 7-inch vernier theodolite reading to 10″.

The positions of these secondary stations are included with those of the primary stations, and are believed to be correct within 40 or 50 feet.

HAMILTON ASTRONOMIC STATION, MONTANA.

Situated on the eastern side of the railroad right of way, 50 feet east of the eastern rail of track and 80 feet northeast of the depot at Hamilton. The quarter corner between secs. 25 and 30, Rs. 20 and 21 W., T. 6 N., is distant N. 39° 13′ W., true bearing, 339 feet.

Observations for time were made on three nights. Telegraphic comparisons of time were made with the Washington Observatory, St. Louis, on the same nights. Prof. H. S. Pritchett was the observer at the Washington Observatory and Mr. S. S. Gannett at the Hamilton station.

The resulting longitude for the Hamilton station is 114° 09′ 09″.40 ± 0″.11.

The mean latitude from 56 sets of observations is 46° 14′ 53″.91 ± 0″.11.

A meridian mark was set 2,377 feet south of pier on the section line, 213.4 feet east of corner between secs. 31, 36, 25, and 30, T. 6 N., R. 20 W.

BITTERROOT BASE, MONTANA.

Measured with 300-foot steel tape stretched along the top of the eastern rail of the track of the Northern Pacific branch to Hamilton with a tension of 20 pounds.

The resulting length, when reduced to sea level and corrected for temperature and inclination, is 28,158.852 feet.

WILLOW, RAVALLI COUNTY, MONTANA.

A station in the base expansion, situated 15 miles northeast of Hamilton, on a bald summit of the range on the eastern side of the Bitterroot Valley, and about 4,000 feet above it. It can be reached by following up Willow Creek from Corvallis to a half-finished log cabin, thence up a leading spur to the station, the latter part of the way being through lodge-pole pines and difficult to traverse. This station can be used in the extension of triangulation in any direction excepting eastward.

Station mark: A lone tree, trimmed.

[Latitude, 46° 19′ 14″.15. Longitude, 113° 55′ 21″.57.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Daly	37 52 02.00	217 47 48.75	4.0875630
El Capitan	46 38 13.00	226 17 46.1	4.7018600
South base	52 06 38.56	231 56 56.56	4.3401538
Ward (2)	59 11 33.24	238 55 53.90	4.5116330
Ward (1)	59 20 44.57	239 05 10.47	4.5084996
Astronomic pier	65 41 35.41	245 31 37.08	4.2891104
North base	74 49 03.84	254 38 55.30	4.2712508
St. Mary	131 06 13.50	310 52 19.34	4.5129510

DALY, RAVALLI COUNTY, MONTANA.

A station used only in the expansion of the base, situated 6 miles east of Hamilton, on land owned by Marcus Daly. It is on a rounded bald knob about 1,000 feet above the valley, and would be of no use in extending triangulation eastward, as much higher points are back of it.

Station mark: A bronze tablet set in shaly rock.

[Latitude, 46° 14′ 01″.21. Longitude, 114° 01′ 12″.03.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South base	68 44 55.92	248 39 27.36	4.0199315
Ward (2)	71 02 12.83	250 50 47.11	4.3334344
Ward (1)	71 23 34.32	251 12 13.86	4.3291730
North base	114 19 16.11	294 13 21.18	4.0623393
St. Mary	151 11 32.72	331 01 52.82	4.5495169
Willow	217 47 48.75	37 52 02.00	4.0875631

SOUTH BASE, RAVALLI COUNTY, MONTANA.

One-third of a mile south of the railroad station at Grantsdale, on prolongation of railroad tangent and about 500 feet south of its extremity. The station is on slightly elevated ground just west of an irrigation ditch.

Station mark: A copper bolt 1 inch in diameter sunk 3½ inches in a rock 8 inches square on top, set 3 feet in the ground.

Reference mark: A cross cut in the top of a rock 10 feet westward and at right angles to the base line.

[Latitude, 46° 11′ 58″.05. Longitude, 114° 08′ 47″.12.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Ward (1)	73 50 35.38	253 44 43.50	4.0370748
St. Mary	168 02 43.96	347 58 33.55	4.5515850
North base	174 49 09.85	354 48 43.70	3.9336308
Willow	231 56 56.56	52 06 38.56	4.3401538
Daly	248 39 27.36	68 44 55.92	4.0199315

NORTH BASE, RAVALLI COUNTY, MONTANA.

Two miles north of Hamilton, on prolongation of the railroad tangent, opposite the sawmill at Riverside and 19.5 feet south of a fence running east and west.

Station mark: Bronze tablet set in a rock.

Reference marks: Crosses cut on rocks set respectively 10 feet north, east, and west of the station.

[Latitude, 46° 16′ 34″.89. Longitude, 114° 09′ 23″.33.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Ward (1)	39 54 25.84	219 48 59.87	4.1788528
St. Mary	165 53 52.84	345 50 08.51	4.4330820
Willow	254 38 55.30	74 49 03.84	4.2712508
Daly	294 13 21.18	114 19 16.11	4.0623393
South base	354 48 43.70	174 49 09.85	3.9336308
Astronomic pier	354 32 02.44	174 32 12.50	3.4958579

ST. MARY, RAVALLI COUNTY, MONTANA.

Eight miles west of Stevensville. To reach the station, go to Curlew extension, north end of Curlew mine, and follow the ridge nearly to the top, then turn off on right-hand ridge and follow it to main dividing ridge, along which a trail is plainly blazed to the lake, which is about 1½ miles north of station and 8 miles northwest of Curlew.

Station mark: A copper bolt in solid rock, above which is a rock cairn 8 feet in diameter and 10 feet high.

[Latitude, 46° 30′ 46″.22. Longitude, 114° 14′ 33″.14.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Ward (1)	4 35 14.87	184 33 32.40	4.5797243
Ward (2)	4 47 49.15	184 46 01.41	4.5820774
El Capitan	11 54 41.10	191 48 04.30	4.7578320
Willow	310 52 19.34	131 06 13.50	4.5129510
Daly	331 01 52.82	151 11 32.72	4.5495169
North base	345 50 08.51	165 53 52.84	4.4330820
South base	347 58 33.55	168 02 43.96	4.5515850

WARD (1), RAVALLI COUNTY, MONTANA.

Six miles, air line, southwest of Grantsdale. The station is on the northern end, but about 100 feet lower than the highest point, of the high mountain just north of Roaring Lion Creek. The summit extends northeast and southwest about one-fourth mile.

Station mark: A copper bolt in the solid rock, above which is a rock cairn 5 feet in diameter at base and 10 feet in height.

[Latitude, 46° 10′ 19″.61. Longitude, 114° 16′ 54″.78.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
St. Mary	184 33 32.40	4 35 14.87	4.5797243
North base	219 48 59.87	39 54 25.84	4.1788524
Willow	239 05 10.47	59 20 44.57	4.5084996
Daly	251 12 13.86	71 23 34.32	4.3291720
South base	253 44 43.50	73 50 35.38	4.0370748

WARD (2), RAVALLI COUNTY, MONTANA.

A second station to be used in the main scheme of triangulation was established on the extreme summit, about 800 feet southwest of Ward (1). A long ridge of easy slope leads to the station from the southeastern side.

Station mark: A copper bolt in the solid rock, above which is a rock cairn 5 feet in diameter at base and 8 feet in height.

[Latitude, 46° 10′ 13″.32. Longitude, 114° 17′ 02″.05.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
El Capitan	25 37 08.00	205 32 19.60	4.2993100
St. Mary	184 46 01.41	4 47 49.15	4.5820774
Willow	238 55 53.90	59 11 33.24	4.5116335
Daly	250 50 47.11	71 02 12.83	4.3334344

TRAPPER, RAVALLI COUNTY, MONTANA.

[A SECONDARY STATION, NOT OCCUPIED.]

The highest point in the Bitterroot Range, at head of Trapper Creek. It is 10 miles, air line, west of Evelyn.

[Latitude, 45° 53′ 27″.3. Longitude, 114° 17′ 45″.2.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Ward (2)	181 42 18	1 42 49	4.49235
Willow	211 00 26	31 16 34	4.74665

BLUE NOSE, MONTANA–IDAHO.

[A SECONDARY STATION.]

On boundary line between Ravalli County, Montana and Lemhi County, Idaho, 1 mile west of South Fork Pass.

Station mark: A rock monument.

[Latitude, 45° 28′ 25″.0. Longitude, 114° 21′ 22″.4.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Salmon	113 22 59	293 02 28	4.60952
El Capitan	177 06 08	357 04 28	4.77486

EL CAPITAN, RAVALLI COUNTY, MONTANA.

The station is on the central chimney of the main peak. It can be reached by going up the main fork of Rock Creek about 12 miles from Lake Como, to a point where a creek comes in from the south over a series of falls about 200 feet high. Proceed upstream about 200 yards above this point to a point where a blazed trail comes in from the south, crossing Rock Creek about 200 yards above the falls. A trail was cut and blazed up the south fork of Rock Creek to an elevation of over 6,000 feet.

Station mark: A copper plug in solid rock.

[Latitude, 46° 00′ 31″.34. Longitude, 114° 23′ 42″.42.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
St. Mary	191 48 04.3	11 54 41.1	4.757832
Ward (2)	205 32 19.6	25 37 08.0	4.299310
Willow	226 17 46.1	46 38 13.0	4.701860

DIVIDE, MISSOULA COUNTY, MONTANA.

A knoll on divide of Bitterroot Mountains. It is not the highest point or nearest to the State line, but it is almost cleared of timber. It is best reached from Heron, Montana, by the Elk Creek trail.

Station mark: A copper bolt sunk in solid rock, above which is a rock cairn 3 feet in height and 3 feet in diameter.

[Latitude, 47° 57′ 57″.51. Longitude, 116° 01′ 33″.08.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Chilco	77 47 46.64	257 25 15.62	4.5875062
Round Top	154 34 02.58	334 24 02.60	4.5855553
Scotchman	170 18 05.87	350 15 33.38	4.4001417

DIVIDE, MONTANA–IDAHO.

[A SECONDARY STATION.]

On the main summit of the Bitterroot Range, on the boundary line between Montana and Idaho; 20 miles (air line) west of Grantsdale. It can be reached from the Lost Horse Pass (camp being at Twin Lakes) by following the northwest face of the mountain northeast from the Twin Lakes to the crossing of Moose Creek; follow the creek up to the Meadows, and the peak then lies to the northwest, about 2,000 feet above the meadow.

Station mark: A rock cairn 5 feet in diameter and 8 feet in height.

[Latitude, 46° 11′ 32″.1. Longitude, 114° 28′ 12″.2.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Ward (2)	279 32 28	99 40 31	4.16360
El Capitan	344 06 39	164 09 53	4.32652

GRAVE, IDAHO COUNTY, IDAHO

[A SECONDARY STATION.]

Six miles by trail south of West Walton Lake. Climb the ridge west of the lake and follow the crest to the peak.

Station mark: Rock cairn built over a copper bolt in the solid rock.

[Latitude, 46° 23′ 46″.75 Longitude, 114° 43′ 42″.4.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Rocky Ridge	95 42 29	275 08 30	4.78088
Rhodes	172 31 50	352 29 31	4.49670
St. Mary	250 41 33	71 02 41	4.59677
Ward (2)	306 05 03	126 24 20	4.62816

RHODES, SHOSHONE COUNTY, IDAHO.

[A SECONDARY STATION.]

This peak can best be reached from the Lolo trail via the Lost Lakes, keeping the ridges to the southwest from the peak. There is a small lake 1½ miles southwest of the peak, at an elevation of 7,100 feet, and 300 feet south of a divide between North Fork and Middle Fork drainages.

Station mark: Rock cairn over a copper bolt in the solid rock.

[Latitude, 46° 40′ 34″.6. Longitude, 114° 46′ 54″.5.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
St. Mary	293 32 31	113 56 02	4.65464
Grave	352 29 31	172 31 50	4.49670
Rocky Ridge	65 48 32	245 16 47	4.78797

SALMON, IDAHO COUNTY, IDAHO.

[A SECONDARY STATION.]

Eight or 10 miles north of the Salmon River. It can be reached from a point where the Shoup trail leaves the Nes Perces trail, 5 miles east of Little Salmon Valley or Meadows, by a three days' trip, beginning with the Shoup trail and taking all left-hand trails. The station is on the western end of the main summit.

Station mark: A copper bolt in large rock, with rock monument above it 7 feet in diameter and 9 feet in height.

[Latitude, 45° 37′ 04″.5. Longitude, 114° 59′ 06″.1.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hump	90 38 35	270 01 34	4.82819
Pilot	115 37 53	295 00 24	4.87531
Elk	152 04 14	331 54 34	4.57124
El Capitan	218 03 38	38 22 34	4.74256
Blue Nose	293 02 28	113 22 59	4.60952

ELK, IDAHO COUNTY, IDAHO.

[A SECONDARY STATION.]

Twenty-one miles, air line, northeast of Elk City, but requiring three days' travel to reach it by way of Anderson Butte and Selwa Creek, or two days' travel from Little Salmon Camp on Nes Perces trail, which camp is three days' travel east of Elk City. The summit is a mass of

granite rock, 10 feet high and 20 feet in length, which comes to a point, though not well defined. The peak is timbered on southwest slope.

Station mark: A copper plug stamped "U. S. G. S.," over which is a rock monument 5 feet in diameter and 4 feet in height.

[Latitude, 45° 54′ 49″.8. Longitude, 115° 03′ 35″.6.]

To station—	Azimuth.	Back Azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
The Hump	57 01 28	236 34 01	4.77343
Pilot	89 19 45	268 51 52	4 70090
Ward (2)	244 19 41	64 53 12	4.82270
El Capitan	258 11 32	78 40 13	4.72108
Salmon	331 54 34	152 04 14	4.57124

CRAG, IDAHO COUNTY, IDAHO.

[A SECONDARY STATION, NOT OCCUPIED.]

[Latitude, 46° 10′ 42″.8. Longitude, 115° 12 11″.2.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
St. Mary	242 58 43	63 40 25	4.91783
El Capitan	286 31 05	107 06 01	4.81473

ROCKY RIDGE, SHOSHONE COUNTY, IDAHO.

[A SECONDARY STATION.]

Two miles by Lolo trail west from Weitus Creek, which is 16 miles by trail west from Bald Mountain.

Station mark: Bronze tablet with a rock monument built above it.

Reference mark: A pine tree bearing 196½° (mag.), distant 11.5 feet.

[Latitude, 46° 26′ 51″.65. Longitude, 115° 30′ 37″.25.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Rhodes	245 16 47	65 48 32	4.78797
Grave	275 08 30	95 42 29	4.78088

THE HUMP, IDAHO COUNTY, IDAHO.

[A SECONDARY STATION, NOT OCCUPIED.]

Also known as Buffalo Hump. It is 15 miles, air line, southwest of Elk City.

[Latitude, 45° 37′ 17″.1. Longitude, 115° 41′ 53″.7.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Elk	236 34 01	57 01 28	4.77343
Salmon	270 01 34	90 38 35	4.82819

PILOT KNOB, IDAHO COUNTY, IDAHO.

[A SECONDARY STATION.]

This station can be easily reached from the Summit House, on the Grangeville-Elk City road, 30 miles from Elk City. The station is on the southern and higher of two summits. The northern summit is a bold, rocky cliff, with several small monuments on it; the southern one was partly timbered, but now is nearly cleared of timber and gives an extensive view in all directions.

Station mark: A bronze tablet set in a granite bowlder 1.7 feet north of a lone pine tree used as a signal.

[Latitude, 45° 54′ 24″.06. Longitude, 115° 42′ 25″.3.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Elk	268 51 52	89 19 45	4.70090
Salmon	295 00 24	115 37 53	4.87531

IDAHO AND WASHINGTON.

The triangulation dependent upon the Spokane, Washington, base was extended eastward across northern Idaho to establish points on or near the Idaho-Montana boundary line, which is the thirty-ninth meridian west of Washington. Fifteen stations were built and nine occupied by Mr. E. T. Perkins, jr.

The average error of closure of triangles is 2″.9.

SCOTCHMAN, KOOTENAI COUNTY, IDAHO.

On the southwestern one of three summits, about a mile west of Idaho-Montana boundary line and 6 miles northeast of Clarks Fork, a station on the Northern Pacific Railroad. It can be ascended from Lightning Creek by an old Indian trail—a roundabout way, though the easiest one.

Station mark: A copper bolt in solid rock, above which is a rock cairn 5 feet in diameter and 5 feet in height.

[Latitude, 48° 11′ 19″.36. Longitude, 116° 04′ 58″.02.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Chilco	45 30 01.97	225 10 00.98	4.6724527
Blacktail	76 42 07.01	256 22 33.71	4.5246835
Round Top	129 21 22.70	309 13 54.54	4.2047087
Divide	350 15 33.38	170 18 05.87	4.4001417

ROUND TOP, KOOTENAI COUNTY, IDAHO.

Northeast of Hope, on the Sherry trail, near Hogeye Camp. The station is on the south end of the summit, which extends 100 yards north and south.

Station mark: A copper bolt sunk in rock, above which is a rock cairn 5 feet in diameter and 5 feet in height.

[Latitude, 48° 16′ 47″.86. Longitude, 116° 14′ 58″.88.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Chilco	26 00 41.75	205 48 07.02	4.6816159
Blacktail	48 22 33.96	228 10 27.76	4.4305996
Scotchman	309 13 54.54	129 21 22.70	4.2047087
Divide	334 24 02.60	154 34 02.58	4.5855553

BLACKTAIL, KOOTENAI COUNTY, IDAHO.

On a bald point near the south end of summit, near the western shore of Lake Pend d'Oreille and east of Cocolalla, on Northern Pacific Railroad. It can be easily reached by trail from T. Trumbull's ranch.

Station mark: A copper bolt sunk in the solid rock, above which is a cairn of rocks 5 feet in diameter and 5 feet in height.

[Latitude, 48° 07′ 07″.09. Longitude, 116° 31′ 13″.03.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Chilco	1 53 09.56	181 52 39.78	4.4029303
Skalan	32 38 06.17	212 17 12.70	4.8158528
Carlton	63 50 44.00	243 24 10.03	4.6954456
Round Top	228 10 27.76	48 22 33.96	4.4305996
Scotchman	256 22 33.71	76 42 07.01	4.5246835

CHILCO, KOOTENAI COUNTY, IDAHO.

On the south end of a grassy summit south of the steamboat landing on Lake Pend D'Oreille, between heads of Traille River and Rausch Creek. It can be easily reached from Collings ranch, by Leiling trail.

Station mark: A copper bolt sunk in solid rock, above which is a rock cairn 5 feet in diameter at base and 5 feet in height.

[Latitude, 47° 53′ 28″.75. Longitude, 116° 31′ 53″.09.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Skalan	49 06 20.29	228 45 58.75	4.6587752
Carlton	94 27 33.97	274 01 32.58	4.6416575
Blacktail	181 52 39.78	1 53 09.56	4.4029303
Round Top	205 48 07.02	26 00 41.75	4.6816159
Scotchman	225 10 00.98	45 30 01.97	4.6724527
Divide	257 25 15.62	77 47 46.64	4.5875062

SKALAN, KOOTENAI COUNTY, IDAHO.

Twenty miles east of Spokane, Washington, and 3 miles east of Washington-Idaho boundary line. The summit is a bald rocky ridge, and can be reached by a good trail from Dr. Dennison's ranch, on the east side of Skalan Creek.

Station mark: A copper bolt set in the solid rock, above which is a rock cairn 5 feet in diameter at base and 5 feet in height.

[Latitude, 47° 37′ 19″.26. Longitude, 116° 59′ 23″.15.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Moran	83 38 50.36	263 25 05.73	4.3704936
Little Baldy	110 13 20.40	289 58 08.50	4.4378494
Carlton	164 08 34.00	344 02 57.76	4.5378730
Blacktail	212 17 12.70	32 38 06.17	4.8158528
Chilco	228 45 58.75	49 06 20.29	4.6587750

CARLTON, SPOKANE COUNTY, WASHINGTON.

About 35 miles by road and trail northeast of Spokane, Washington. The mountain has two summits, of nearly equal height and about one-third of a mile apart. The station is located on the southern summit, which is flat and bald, but has a growth of pine and spruce trees on its western side. There is a good trail to station from "The Meadows."

Station mark: A copper bolt set in the solid rock, above which is a rock cairn 5 feet in diameter and 5 feet in height.

[Latitude, 47° 55′ 13″.71. Longitude, 117° 06′ 57″.26.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Little Baldy	34 23 09.49	214 13 31.91	4.4589864
Tomkinson	50 07 28.61	229 52 16.64	4.5239434
Blacktail	243 24 10.03	63 50 44.00	4.6954456
Chilco	274 01 32.58	94 27 33.97	4.6416575
Skalan	344 02 57.76	164 08 34.00	4.5378730

OREGON.

Triangulation in eastern Oregon depends upon an astronomic station at Baker and upon a base line 6 miles in length, measured along the tangent of the Oregon Railroad and Navigation Company's line between Baker and Haines. Five stations in the expansion of the base were built and occupied by Mr. S. S. Gannett.

The average closure error of the triangles is 2″.0.

BAKER ASTRONOMIC STATION OF 1897.

The brick pier which serves as a support for the astronomic transit and zenith telescope, and also as a permanent mark for the station, is located in the grounds of the high school at Baker, Oregon, 127.5 feet east of the center of the tower on the building. It is in sec. 17, T. 9 S., R. 40 E.

The computed mean latitude is 44° 46′ 41″.56.

The longitude was obtained by time observations and telegraphic exchange of clock signals with the Washington Observatory, St. Louis, Missouri, on August 23, 25, 26, and 27. The computed mean longitude is 117° 50′ 09″.68 west of Greenwich.

Prof. H. S. Pritchett was the observer at the Washington Observatory and Mr. S. Gannett at the Baker station.

BAKER BASE LINE, BAKER COUNTY.

Measured along the tangent of the Oregon Railroad and Navigation Company's road, beginning 3 miles northwest of Baker City and continuing to within 1 mile of Haines. A 300-foot steel tape was used under a tension of 20 pounds, and the temperature was obtained by reading three thermometers at each tape length. The adopted length, corrected for temperature and slope and reduced to sea level, is 30,295.829 feet.

Logarithm of length, reduced to meters, 3.9653988.

LONE PINE, BAKER COUNTY.

On the highest one of several bare hills about 5 miles ESE. of Baker. It can be reached by following the Virtue road about 3 miles, thence up a ridge to the Lone Pine Gulch, thence to the head of the gulch, thence northward and westward to the highest summit.

Station mark: A copper bolt in volcanic rock, above which a rock cairn 4 feet in height was erected.

[Latitude, 44° 45′ 14″.47. Longitude, 117° 44′ 27″.19.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Elkhorn	103 24 55.76	283 10 46.04	4.4353987
South base	126 06 19.48	306 00 35.64	4.1229244
North base	137 01 32.94	316 53 32.93	4.3407735
Magpie	165 49 38.56	345 46 47.72	4.3362935

MAGPIE, BAKER COUNTY.

On the highest summit of a bare ridge 10 miles NNE. of Baker. A wagon road runs to foot of ridge on southwest side.

Station mark: A copper bolt in solid rock.

[Latitude, 44° 56′ 35″.71. Longitude, 117° 48′ 29″.44.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South base	22 13 40.57	202 10 47.10	4.1546134
Elkhorn	55 11 46.33	235 00 26.13	4.4116290
North base	62 31 48.00	242 26 38.25	4.0353371
Lone Pine	345 46 47.72	165 49 38.56	4.3362935

BAKER HIGH SCHOOL, BAKER COUNTY.

The peak of the tower on the building was connected by direct measurement with the astronomic pier, and by triangulation with stations in the base expansion.

[Latitude, 44° 46′ 41″.56. Longitude, 117° 50′ 11″.45.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Elkhorn	100 46 57.01	280 36 49.65	4.2851940
South base	148 20 30.94	328 18 49.60	3.7795855

SOUTH BASE, BAKER COUNTY.

Three miles northward from Baker City, one-half mile north of corner of Ts. 8 and 9 S., Rs. 39 and 40 E., on the eastern side of the railroad right of way, 3,302 feet south of mile post 353.

Station mark: Cross cut on bronze tablet set in top of stone post 12 by 12 by 36 inches.

Reference marks: First, small hole drilled in top of dressed-stone post set on fence line 13 feet east of geodetic point. Second, a cross cut in top of dressed-stone post set 9.20 feet west of geodetic point.

[Latitude, 44° 49′ 27″.53. Longitude, 117° 52′ 35″.26.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Elkhorn	84 29 03.31	264 20 37.07	4.2002123
North base	152 43 48.00	332 41 31.98	3.9653988
Magpie	202 10 47.10	22 13 40.57	4.1546134
Lone Pine	306 00 35.64	126 06 19.48	4.1229244

NORTH BASE, BAKER COUNTY.

Nine miles north of Baker City, 1 mile south of Haines, on the eastern side of railroad right of way, and 614 feet north of mile post 348, 155.3 feet south of an east-west fence.

Station mark: Cross cut on bronze tablet set in top of stone post 12 by 12 by 36 inches.

Reference marks: First, a cross cut on a stone post set on the fence line 12.80 feet east of geodetic point. Second, a cross cut on a stone post set 7.10 feet west of geodetic point.

[Latitude, 44° 53′ 53″.38. Longitude, 117° 55′ 48″.10.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Elkhorn	49 51 01.71	229 44 51.13	4.1791269
Magpie	242 26 38.25	62 31 48.00	4.0353371
Lone Pine	316 53 32.93	137 01 32.94	4.3407735
South base	332 41 31.98	152 43 48.00	3.9653988

ELKHORN, BAKER COUNTY.

On the highest peak of the range 12 miles west of Baker. It can be reached by following a wood road up Marble Creek past the limekiln to the summit of the range, thence northwestward along the crest 3 miles to the peak.

Station mark: A copper bolt in flint rock.

[Latitude, 44° 48′ 37″.53. Longitude, 118° 04′ 33″.51.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
North base	229 44 51.13	49 51 01.71	4.1791269
Magpie	235 00 26.13	55 11 46.33	4.4116290
South base	264 20 37.07	84 29 03.31	4.2002123
Lone Pine	283 10 46.04	103 24 55.76	4.4353987

BAKER, BAKER COUNTY; MERIDIAN MARKS.

The meridian line, 545 feet in length, was established at Baker with the astronomic transit, the south mark being the astronomic pier located in the grounds of the High School, 127.5 feet east of the tower on the school building. The north mark is a dressed stone, 12 by 12 by 36 inches, set on the north curb line of the street 545 feet north of the astronomic pier. A cross cut on a United States Geological Survey bronze bench-mark tablet marks the exact oint in each case.

UTAH.

This work starts from a line of the United States Coast and Geodetic Survey transcontinental belt, Deseret-Nebo, extends in a northeasterly direction, and is to give locations for the survey of the Uinta Forest Reserve. Ten stations were occupied and 15 triangles closed, the average closure error being 2″.57.

A few secondary points were sighted in Utah near the southwest corner of Wyoming. The corner stone was also located by a secondary triangle. All the field work was by Mr. H. L. Baldwin, jr.

PORCUPINE, SUMMIT COUNTY.

On the large mountain, 3 miles west of the southwest corner of Wyoming.

Station mark: Copper bolt stamped "U. S. G. S."

Reference mark: A rock monument at a distance of 14.95 feet; true azimuth from station, 78°.

[Latitude, 41° 01′ 00″.17. Longitude, 111° 06′ 40″.87.]

To station—	Azimuth	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Kamas	11 31 54.18	191 28 28.47	4.5674578
Clayton	38 46 11.15	218 28 33.86	4.7836258
Wanship	59 59 13.09	239 44 40.67	4.5565128

CURRANT CREEK PEAK, WASATCH COUNTY.

On the west boundary line of the Indian reservation and about 18 miles south of east of Heber.

Station mark: A drill hole 4 inches deep and 1 inch in diameter in a hard granite rock on summit.

[Latitude, 40° 22′ 36″.33. Longitude, 111° 10′ 32″.87.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Spanish Fork	43 04 51.17	222 51 10.91	4.6439457
Timpanogos	91 09 28.06	270 51 31.67	4.5932756
Clayton	125 58 56.60	305 43 56.80	4.6050598
Wanship	154 05 42.95	333 53 47.20	4.7704878
Kamas	176 49 16.43	356 48 22.83	4.5431206

KAMAS, SUMMIT COUNTY.

This station is on a peak of the same name, about 2 miles north and 4 miles east of the town of Kamas.

Station mark: A copper bolt set in a sandstone rock and stamped "U. S. G. S."

Reference point: An arrow head cut in a large sandstone rock; true azimuth from station being 333° 6′; distance, 11.33 feet.

[Latitude, 40° 41′ 26″.80. Longitude, 111° 11′ 55″.35.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Spanish Fork Peak	22 45 45.04	202 32 55.57	4.8616176
Timpanogos	47 32 07.45	227 15 01.19	4.7032009
Clayton	69 54 23.64	249 40 14.68	4.5137415
Wanship	127 18 20.76	307 07 16.58	4.4763859
Porcupine	191 28 28.47	11 31 54.18	4.5674578
Currant Creek Peak	356 48 22.83	176 49 16.43	4.5431206

WANSHIP, ON BOUNDARY LINE BETWEEN SUMMIT AND MORGAN COUNTIES.

On the highest mountain, about 4 miles northwest from Wanship railroad station.

Station mark: Copper bolt in solid rock.

Reference mark: A rock cairn distant 5.4 feet; true azimuth from station being 198°.

[Latitude, 40° 51′ 14″. Longitude, 111° 28′ 52″.38.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Clayton	12 54 39.25	192 51 32.37	4.4792661
Porcupine	239 44 40.67	59 59 13.09	4.5565128
Kamas	307 07 16.58	127 18 20.76	4.4763859
Currant Creek	333 53 47.20	154 05 42.95	4.7704878

SPANISH FORK PEAK, UTAH COUNTY.

This station is on a peak of the same name, northeast of Denver and Rio Grande Railway and about 8 miles southeast of Springfield.

Station mark: "U. S. G. S." iron post set 2½ feet deep in the loose rock.

Reference mark: A rock monument 6 feet in diameter and 6 feet high, at a distance of 10.3 feet from triangulation station, the true azimuth from it being 134° 55′.

[Latitude, 40° 05′ 11″.26. Longitude, 111° 31′ 42″.85.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Nebo	33 36 02.65	213 26 50.91	4.5674370
Deseret	114 10 46.01	293 28 09.40	5.0092105
Timpanogos	164 20 02.68	344 15 49.80	4.5340190
Kamas	202 32 55.57	22 45 45.04	4.8616176
Currant Creek	222 51 10.91	43 04 51.17	4.6439457

CLAYTON PEAK, AT CORNER OF SUMMIT, SALT LAKE, AND WASATCH COUNTIES.

On a mountain of the same name, about 6 miles southwest of Park City.

Station mark: A copper bolt set in a granite rock near the highest point.

[Latitude, 40° 35′ 21″.23. Longitude, 111° 33′ 38″.83.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Timpanogos	15 50 36.78	195 47 37.89	4.3766688
Wanship	192 51 32.37	12 54 39.25	4.4792661
Porcupine	218 28 33.86	38 46 11.15	4.7836258
Kamas	249 40 14.68	69 54 23.64	4.5137425
Currant Creek	305 43 56.80	125 58 56.60	4.6050598

TIMPANOGOS, UTAH COUNTY.

On the southeast part of peak of the same name. The lower point was selected as being more accessible. The mountain is best ascended along a ridge leading up the east side of Dry Canyon.

Station mark: A drill hole 1 inch in diameter and 1 inch deep in a large sandstone rock.

Reference mark: A rock cairn 4 feet in diameter and 6 feet high at a distance of 4.93 feet, true azimuth from it being 38° 3′.

[Latitude, 40° 22′ 58″.69. Longitude, 111° 38′ 14″.35.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Nebo	9 54 27.75	189 49 26.46	4.8107074
Deseret	95 59 19.23	275 20 48.74	4.9264367
Clayton	195 47 37.89	15 50 36.78	4.3766688
Kamas	227 15 01.19	47 32 07.45	4.7032009
Currant Creek	270 51 31.67	91 09 28.06	4.5932756
Spanish Fork	344 15 49.80	164 20 02.68	4.5340190

NEBO, UNITED STATES COAST AND GEODETIC SURVEY STATION, JUAB COUNTY.

On mountain of same name, about 8 miles nearly north of Nephi.

Station mark: A copper bolt in the solid rock.

Reference mark: A rock monument 6 feet high and 6 feet base; distant 5.8 feet and at an azimuth of 87° 30′ from station mark.

[Latitude, 39° 48′ 32″.92. Longitude, 111° 46′ 02″.13.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Deseret	134 47 21.89	314 14 06.52	5.0118781
Timpanogos	189 49 26.46	9 54 27.75	4.8107074
Spanish Fork Peak	213 26 50.91	33 36 02.65	4.5674370

DESERET PEAK, UNITED STATES COAST AND GEODETIC SURVEY STATION, TOOELE COUNTY.

On highest peak of the Onaqui Mountains.

Station mark: A copper bolt in solid rock, over which is a rock cairn 7 feet high and 6 feet base.

[Latitude, 40° 27′ 29″.00. Longitude, 112° 37′ 37″.70.]

To station—	Azimutth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Timpanogos	275 20 48.74	95 59 19.23	4.9264367
Spanish Fork Peak	293 28 09.40	114 10 46.01	5.0092105
Nebo	314 14 06.52	134 47 21.89	5.0118781

COALVILLE, SUMMIT COUNTY; MERIDIAN MARKS.

The south end of the meridian line is located about 75 feet east of the public road, on the hillside, and about 150 yards southeast of the court-house building, and is marked by a sandstone post set 3 feet in the ground projecting 18 inches. The north end is a bronze tablet set in a sandstone post projecting about 6 inches above the ground, and is about 762 feet north of the south end. It is located near the wire fence on the west side of the road.

PROVO, UTAH COUNTY; MERIDIAN MARKS.

This meridian line is located in the grounds to the east of the court-house. The south end is marked by a copper bolt in the sandstone post set near the southeast corner of the square, and the north end is marked by the iron bench-mark post of the United States Geological Survey. This post is 2 feet south of the diagonal walk leading from the court-house door to the northeast entrance of the grounds.

TOOELE, TOOELE COUNTY; MERIDIAN MARKS.

The meridian line is located on the three lots belonging to the county, and which it is intended shall at a future time be used for a court-house site. This line is within a few feet of the west or front line of the lots, and the ends are near the extreme edges of the lots, the length of line being only 206 feet. Each end is marked by a copper bolt set in a dressed-stone post.

HEBER, WASATCH COUNTY; MERIDIAN MARKS.

This meridian line is located in the court-house grounds. The south end of the line is marked by a sandstone post 18 inches above the ground, in which is set a bronze tablet. The north end is marked by an iron bench-mark post set 36 inches in the ground on the church property and near the north side thereof.

SALT LAKE CITY, SALT LAKE COUNTY; MERIDIAN MARKS.

The meridian line is located on the grounds surrounding the city and county building. The south mark is a cross on a bronze tablet in the top of a sandstone post 5 feet in length and 12 inches square set so as to project about 4 inches above the surface of the ground at a point a few feet north of the east-west gravel walk at the south side of the grounds and about 50 feet east of the west line of the block.

The north mark is similar to the south one, but is situated about 40 feet south of the east-west gravel walk at the south side of the grounds and about 2 feet south of the diagonal walk from the corner of the square to the west end of the building.

NEPHI, JUAB COUNTY; MERIDIAN MARKS.

The meridian line is located near the east side of the public square, situated near the north end of the town. The south end is marked by a bronze tablet set in a sandstone post 3 feet in the ground and projecting about 6 inches above the surface. The post is in the street, about 2 feet south of the ditch at the edge of the sidewalk near the southeast gate of the square. The north mark is a copper bolt set in a white sandstone block 17 feet south of the north line of the square. The approximate distance between the marks is 430 feet.

SOUTHERN CALIFORNIA.

Control for the Fernando and Tejunga quadrangles, in southern California, was obtained by Mr. S. S. Gannett, who extended triangulation from the Coast and Geodetic Survey stations San Juan and Southeast Base northwestward 50 miles, 7 stations being occupied.

The average closure error of the triangles is 1″.79.

SAN JUAN, ON BOUNDARY LINE BETWEEN ORANGE AND SAN BERNARDINO COUNTIES.

A Coast and Geodetic Survey station on the highest point of the first cluster of hills west of the Santa Ana River and south of Chino.

Station mark: A hole drilled in a stone and filled with lead, above which is erected a stone and cement pier 3 feet in diameter and 3 feet in height, serving also as a county-line monument.

[Latitude, 33° 54′ 43″.90. Longitude, 117° 44′ 21″.09.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Southeast base	54 40 32.61	234 33 43.18	4.3650185
Workman	109 31 03.03	289 22 10.68	4.4142424
San Gabriel	137 47 28.61	317 35 21.55	4.6939479

SOUTHEAST BASE, LOS ANGELES COUNTY.

A Coast and Geodetic Survey station about 100 meters west of the main road from Anaheim to Garden Grove and about 1 mile from the last-named place.

Station mark: A small hole in the silver core of a copper bolt, set in a granite block, 20 inches square, which is set in the brick foundation of the pier. A tower 14 feet square at the base and 40 feet high was erected around the brick pier.

[Latitude, 33° 47′ 28″.38. Longitude, 117° 56′ 36″.08.]

To station—	Azimuth.	Back azimuth.	Log. Distance.
	° ′ ″	° ′ ″	*Meters.*
Workman	165 45 19.77	345 43 18.10	4.3571785
San Juan	234 33 43.18	54 40 32.61	4.3650185

WORKMAN, LOS ANGELES COUNTY.

On the highest point of a cluster of hills lying directly between the towns of Whittier and Puente. It can be reached with a wagon from Whittier by following a wagon road up the canyon to the upper reservoir, thence on horseback to the head of the canyon and along the divide eastward to the station.

Station mark: A glass bottle, neck upward, about 1 foot below surface of ground.

[Latitude, 33° 59′ 24″.35. Longitude, 118° 00′ 14″.29.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cohuenga	118 29 36.04	298 18 45.01	4.5300320
San Gabriel	162 28 43.40	342 25 30.25	4.4664643
San Juan	289 22 10.68	109 31 03.03	4.4142424
Southeast base	345 43 18.10	165 45 19.77	4.3571785

SAN GABRIEL, LOS ANGELES COUNTY.

Fifteen miles, air line, northeast of Los Angeles. To reach the station go to the Alpine Tavern, Mount Lowe, by rail; thence to the foot of the peak by trail, then climb 1,000 feet elevation through brush and over loose stones.

Station mark: A rock monument 5 feet in diameter and 6 feet in height.

[Latitude, 34° 14′ 30″.19. Longitude, 118° 05′ 58″.68.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cohuenga	60 41 08.29	240 33 28.66	4.3808679
Fernando	111 43 45.00	291 32 33.79	4.5155083
Gleason	153 46 31.18	333 43 50.65	4.2166176
O'Dell	159 25 09.97	339 20 32.83	4.5510244
San Juan	317 35 21.55	137 47 28.61	4.6939479
Workman	342 25 30.25	162 28 43.40	4.4664643

GLEASON, LOS ANGELES COUNTY.

About 6 miles, air line, south of Acton. The summit is a long flat ridge covered with a scattering growth of large pine trees. The station is located on nearly the highest point of summit. It can be reached from Acton by wagon road 5 miles to foot of mountain, thence by a well-graded mining trail 5 miles to station.

Station marks: A copper bolt 1 foot below surface of ground, above which is a pile of rocks 3 feet in diameter and 3 feet in height.

[Latitude, 34° 22′ 29″.54. Longitude, 118° 10′ 43″.48.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fernando	83 27 23.78	263 18 52.18	4.3676701
O'Dell	164 12 05.70	344 10 08.58	4.2843385
San Gabriel	333 43 50.65	153 46 31.18	4.2166176

O'DELL, LOS ANGELES COUNTY.

Six miles NNW. of Acton. The station is on the western end of a long flat ridge 1½ miles NNW. of Mr. O'Dell's house. The ridge is nearly free from brush.

Station mark: A copper bolt sunk in the solid outcropping ledge, above which is a rock cairn 8 feet in diameter and 8 feet in height.

[Latitude, 34° 32′ 30″.49. Longitude, 118° 14′ 08″.98.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fernando	40 12 54.37	220 06 17.92	4.4431714
San Gabriel	339 20 32.83	159 25 09.77	4.5510244
Gleason	344 10 08.58	164 12 05.70	4.2843385

COHUENGA, LOS ANGELES COUNTY.

A well-known mountain 9 miles by road and trail northwest of the city of Los Angeles, 1 mile east of Cohuenga Pass. A trail starts up the mountain from the ranch of Mr. Cruz, by which a horse can be taken nearly to the station.

Station mark: Spikes driven into a hole drilled in the sandstone rock, above which is a rock monument 6 feet in diameter at base and 6 feet in height.

[Latitude, 34° 08′ 07″.50. Longitude, 118° 19′ 36″.66.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fernando	158 13 33.78	338 10 03.76	4.4101782
San Gabriel	240 33 28.66	60 41 08.29	4.3808679
Workman	298 18 45.01	118 29 36.04	4.5300320

FERNANDO, LOS ANGELES COUNTY.

On the western end of the highest ridge, about 6 miles north-northeast of Fernando. It can be reached by following the trail which starts from the house of Jack Hendrickson and crosses the divide 2 miles west of station.

Station mark: "U. S. G. S." bronze tablet set in sand rock, above which is a rock monument 6 feet in diameter at base and 7 feet in height.

[Latitude, 34° 21′ 02″.37. Longitude, 118° 25′ 49″.90.

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
O'Dell	220 06 17.92	40 12 54.37	4.4431714
Gleason	263 18 52.18	83 27 23.78	4.3676701
San Gabriel	291 32 33.79	111 43 45.00	4.5155083
Cohuenga	338 10 03.76	158 13 33.78	4.4101782

LOS ANGELES, LOS ANGELES COUNTY; MERIDIAN MARKS.

The true bearing of Broadway, between the city hall and courthouse, at Los Angeles was determined by observations on Polaris. The city-hall mark is a bronze tablet in a granite post, 6 by 6 by 36 inches, set flush with the surface of the cement sidewalk in front of the tower on the building, 40 inches inside the curb. The tablet is stamped "Azimuth 217° 54′ 20″." The court-house mark is similar to that at the city hall, and is set just north of the driveway entrance to the court-house yard, 40 inches from the curb. The tablet is stamped "Azimuth 37° 54′ 26″."

SPIRIT LEVELING.

In connection with the topographic surveying executed in the various sections during the last field season careful spirit leveling was continued in the manner described in the last annual report.[1] A few minor changes have been made in the manner of recording and marking bench marks, required by act of Congress, and these are described below. The bench marks listed hereafter were established in connection with field work executed since the close of the last annual report, and in many localities this field work was in progress during the entire winter of 1897–98, and the final results have not all reached this office at the close of the present fiscal year. Only such, therefore, as have been finally completed and adjusted are published here.

As explained in the last annual report, changes of datum are of frequent occurrence during the progress of this work, the result of better

[1] Eighteenth Ann. Rept. U. S. Geol. Survey, Part I, 1897, pp. 225–235.

connections with mean sea level in various portions of the country. As a consequence, the elevations above mean sea level published in the last annual report have in some cases been corrected and statements of this fact are published in the accompanying list in the descriptions preceding various lists for the several localities of work and immediately following the State names.

The practice of stamping an initial datum letter or name on the bench marks has been continued as inaugurated toward the close of last season, and having been found entirely satisfactory will be continued in the future. Thus on the tablets and bench-mark posts there is stamped an initial letter which refers to the datum on which the leveling in that region is based, and following the datum letter there is stamped the elevation above mean sea level to the nearest foot. When in the course of further extension of leveling a better height of this datum is determined, such datum is abandoned and a new one selected in the neighborhood. Thereafter future bench marks are stamped with the new datum letter, so that it may be understood that there is a difference between the mean sea level on which this new datum rests and that on which the datum previously selected for this locality is based.

LOCALITIES OF WORK, ETC.

The following table shows the distribution of the leveling parties, localities of work, lengths of closed circuits in miles with their closure errors in feet, and names of levelmen.

Localities of work, lengths of closed circuits, closure errors, and levelmen.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
ATLANTIC SECTION.		*Miles.*	*Feet.*	
New York	Brockport	29	0.203	E. L. McNair.
Do	Salamanca	33	0.142	Do.
Do	Syracuse	37	0.321	Clark Brown.
Do	do	48	0.343	Do.
Do	do	57	0.323	Do.
Do	Remsen	32	0.247	E. L. McNair.
Do	Willetts Point	21	0.010	Clark Brown.
Do	do	31	0.032	Do.
New Hampshire	Peterboro	38	0.034	W. R. Harper.
Do	do	33	0.585	Do.
Do	Whitefield	29	0.065	Do.
Do	do	25	0.042	Do.
Maryland	Cumberland	25	0.207	H. Wood.
Do	do	40	0.003	Do.
West Virginia	Charleston	100	0.648	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Cont'd.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
ATLANTIC SECTION—cont'd.		*Miles.*	*Feet.*	
West Virginia	Charleston	87	1.108	H. Wood.
Ohio	Ironton	51	0.077	E. L. McNair and M. M. Gillett.
Do	do	87	0.004	E. L. McNair.
Do	do	57	0.264	Do.
Do	do	50	0.040	Do.
Do	do	75	0.224	Do.
Georgia	Blue Ridge	50	0.136	T. S. Mauldin, jr.
CENTRAL SECTION.				
North Dakota	Jamestown	89	1.103	Alfred Tyler.
Do	do	18	0.033	Do.
Do	do	92	0.467	Do.
South Dakota	Yankton	34	0.313	Do.
Do	do	53	0.257	Do.
Do	do	80	0.379	Do.
Minnesota - Wisconsin.	Wyoming	36	0.268	S. P. Connor.
Do	do	21	0.734	Do.
Do	do	21	0.078	Do.
Do	do	17	0.078	Do.
Do	do	17	0.069	Do.
Do	do	12	0.004	Do.
Do	do	65	0.079	Do.
Illinois	Chicago	40	0.099	E. S. Smith.
Do	do	40	0.100	Do.
Do	do	33	0.44.	C. K. Gilbert.
Do	do	25	0.35.	Do.
Indiana	do	30	0.123	E. S. Smith.
Iowa-Wisconsin	Dubuque	49	0.038	C. E. Hewitt.
Do	do	44	0.025	Do.
Do	do	44	0.106	Do.
Do	do	64	0.728	Do.
Nebraska	Sidney	72	0.056	Ross C. Cornish.
Do	do	54	0.079	Do.
Do	do	47	0.227	Do.
Do	do	86	0.113	Do.
Do	do	87	0.060	Do.
Do	do	150	0.525	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Cont'd.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
ROCKY MOUNTAIN SECTION.		*Miles.*	*Feet.*	
South Dakota	Deadwood	186	0.236	J. C. Barber and L. F. Gottschalk.
Do	do	67	0.395	J. C. Barber.
Do	do	16	0.080	Do.
Do	do	16	0.031	Do.
Do	do	29	0.212	Do.
Do	do	38	0.401	Do.
Do	do	7	0.033	J. T. Stewart.
Do	do	60	0.098	Do.
Do	do	23	0.147	Do.
Do	do	17	0.098	Do.
Do	do	22	0.139	Do.
Wyoming	Burlington and Missouri Railroad.	4	0.013	C. W. Beach.
Do	do	10	0.031	Do.
Do	do	21	0.049	Do.
Do	do	42	0.037	Do.
Do	do	4	0.044	Do.
Do	do	29	0.033	Do.
Do	Sheridan	200	0.013	E. W. Glafcke and H. M. Huntington.
Montana	Butte	93	0.040	F. B. Whitlock.
Do	do	60	0.130	Do.
Do	do	45	0.320	Do.
Do	do	24	0.175	Do.
Do	do	20	0.210	Do.
Do	do	28	0.240	Do.
Do	do	25	0.258	Do.
Colorado	Denver	15	0.015	Thomas Winsor.
Do	do	120	0.543	Do.
Do	do	54	0.107	Do.
Do	do	98	0.208	Do.
Do	do	2	0.018	Do.
Texas	San Antonio	22	0.298	J. A. Hinman.
Do	do	36	0.051	Do.
Do	do	7	0.043	Do.
Do	do	10	0.117	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Cont'd.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
ROCKY MOUNTAIN SECTION—cont'd.		*Miles.*	*Feet.*	
Texas	San Antonio	13	0.000	J. A. Hinman.
Do	do	42	0.276	Do.
Do	do	15	0.120	Do.
Do	do	14	0.017	Do.
Do	do	18	0.192	Do.
Do	do	81	0.825	Do.
Do	do	64	0.162	Do.
Do	do	25	0.100	Do.
Do	do	16	0.204	Do.
Do	do	41	0.178	Do.
Do	do	22	0.103	Do.
Do	do	34	0.010	Do.
Do	do	129	0.435	Thomas Winsor and J. A. Hinman.
PACIFIC SECTION.				
Montana	Hamilton	10	0.030	C. M. Kurtz.
Do	do	13	0.150	Do.
Do	do	35	0.060	Do.
Do	do	8	0.031	Do.
Idaho	Priest River	8	0.060	Chas. Harlowe, jr.
Washington	Chelan Falls	25	0.178	P. Byrne.
Do	Ellensburg	12	*a* 0.021	H. K. Kalloch.
Do	do	34	*a* 0.132	Do.
Do	do	20	*a* 0.129	Do.
Do	do	11	0.094	Do.
Do	do	52	*a* 0.069	Do.
Do	do	14	*a* 0.030	Do.
Oregon	Myrtle Point	11	0.049	C. C. Ward.
Do	do	85	0.907	Do.
Utah	Eureka	35	0.136	A. B. Searle.
Do	do	7	0.130	Do.
Nevada	Candelaria	20	0.161	C. R. Smith.
Do	do	11	0.008	Do.
Do	do	26	0.108	Do.
Do	do	12	0.098	Do.
Do	do	14	0.093	Do.
Do	do	28	0.067	Do.

a Double-rod lines.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Cont'd.

States.	Datum.	Length of circuit.	Closure error.	Levelmen.
PACIFIC SECTION—continued.		*Miles.*	*Feet.*	
California	San Pedro	69	*a* 0.002	H. S. Crowe.
Do	do	107	*a* 0.076	Do.
Do	do	173	*a* 0.014	Do.
Do	do	88	0.251	Do.
Do	do	16	0.079	G. H. Herrold.
Do	do	35	0.300	Do.
Do	do	22	0.094	Do.
Do	do	32	0.004	Do.
Do	do	42	0.120	Do.
Do	do	34	0.056	Do.
Do	do	73	0.182	Do.
Do	do	96	*a* 0.038	Do.

a Double-rod lines.

In the following lists are published only those elevations checked in closed circuits. These have been adjusted and the closure errors distributed. In addition to the leveling here listed, many hundreds of miles of spirit levels were run in continuous and unchecked lines which will make closures with other circuits or on other known datum points in the course of one or more seasons of work. Accordingly, it has been deemed undesirable to publish such elevations at this time, such publication being postponed until these lines have been closed and the adjustment corrections distributed. A few circuits run during the last season checked out with closure errors larger than that allowed by the limiting formula $0.05\sqrt{\text{distance in miles}}$. As these will have to be rerun to bring them within the limit, they will not be published until such corrections have been made.

ATLANTIC SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. H. M. Wilson, geographer in charge, eleven leveling parties were engaged at various times during the year in running lines of spirit levels for the control of the topographic work being executed in the various localities.

PRECISE LEVELS.

The line of precise levels started at mean sea level at Morehead City, North Carolina, in 1896, was continued in the fall of 1897 from Asheville, North Carolina, via Knoxville and Cleveland, Tennessee, and Rome, Georgia, to Atlanta, Georgia, where work was discontinued for the season.

An incidental result of this precise leveling was to lower the known railway elevations at various points. At Asheville the accepted railway elevations were found to be 9 feet too high; at Morristown they were nearly correct; at Knoxville they were found to be about 9 feet too high, and at Atlanta 18 feet too high. The results of these levels are listed hereafter under the State names "Tennessee–Georgia" (p. 247).

In New York investigation of the precise-level datum points heretofore accepted was made, with the result that corrections to such have been made and are published hereafter under a memorandum following the State title "New York" (pp. 202–203).

NEW HAMPSHIRE AND VERMONT.

COOS AND GRAFTON COUNTIES, NEW HAMPSHIRE, AND ESSEX COUNTY, VERMONT.

LANCASTER QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the west face of a stone foundation of McKean Block, Whitefield, facing the public square, and marked "W 952." The elevation of this bench mark above mean sea level was based on the top of rail in front of center of Boston and Maine Railroad station, Whitefield. The best possible reduction of the profile of this railroad was made, resulting in an elevation at this point of 948 feet, and in accordance with this the height of the bronze tablet is accepted as 952.419 feet.

The leveling was done by Mr. Walter R. Harper, levelman, under the general direction of Mr. Robert D. Cummin, topographer.

All bench marks dependent on this datum are stamped with the letter "W" in addition to the figures of elevation.

WHITEFIELD TO HAZENS JUNCTION, ALONG BOSTON AND MAINE RAILROAD.

	Feet.
Whitefield, top of rail opposite Boston and Maine Railroad station	948.00
Whitefield, 700 feet east of station; top of rail Maine Central Railroad track on iron bridge crossing Johns River, just north of Boston and Maine Railroad	948.73
Whitefield Junction, 2-mile post east of; stone on north side of track 200 feet east of milepost	1,009.00
Hazens Junction, ¼ mile west of; top of rail Boston and Maine Railroad, also Maine Central Railroad, on small bridge over stream flowing north into Johns River	1,019.84
Hazens Junction, top of rail	1,036.69

HAZENS JUNCTION, VIA QUEBEC JUNCTION, TO WAUMBEK JUNCTION ALONG MAINE CENTRAL RAILROAD.

Hazens Junction, top of rail	1,038.40
Hazens Junction, 500 feet southeast of; top of rail at road crossing	1,047.27
Quebec Junction, ½ mile north of; top of rail, on Maine Central Railroad bridge over Carroll stream	1,083.83
Quebec Junction, ¾ mile north of, on Maine Central Railroad going toward Waumbek Junction; top of rail on high culvert	1,125.62
Quebec Junction, 1 mile northeast of and 50 feet north of road crossing; top of southwest corner of west abutment of culvert	1,125.95

	Feet.
Waumbek Junction, culvert ¼ mile south of; top of rail	1,127.11
Waumbek Junction, top of rail at intersection of tracks of Maine Central and Boston and Maine railroads	1,109.61

WAUMBEK JUNCTION, ALONG MAINE CENTRAL RAILROAD, TO LANCASTER, VIA RIVERTON.

Waumbek Junction, 200 feet north of intersection of tracks, in west side of north abutment of small bridge; copper bolt, marked "W. 1105"	1,105.356
Waumbek Junction, 1½ miles northwest of; top of rail at curve	1,135.14
Jefferson station, top of rail opposite	1,107.68
Jefferson station, top of rail at road crossing 300 feet north of	1,105.58
Jefferson station, 1 mile north of; top of rail at public road crossing	1,062.38
Jefferson station, second public road crossing north of; top of rail	1,045.57
Riverton, 400 feet south of crossing 1 mile south of; top of rail over culvert	1,038.14
Riverton, ¼ mile south of public road crossing (there is also a private crossing here); top of rail	1,034.63
Riverton, ⅛ mile south of; top of rail on culvert	1,034.27
Riverton, top of rail, main track, opposite station	1,045.58
Riverton, 20 feet east of and 4 feet south of station between it and highway; copper bolt, in rock ledge, marked "W. 1044"	1,044.533
Lancaster, 1 mile south of; northwest corner of north abutment of Maine Central iron bridge over Israel River	935.94
Lancaster, Maine Central station, top of rail, main track, opposite ticket-office window	886.81
Lancaster, southeast corner second granite step entrance to Coos County court-house	861.49

LANCASTER WESTWARD ACROSS CONNECTICUT RIVER, THENCE SOUTHWEST ON VERMONT SIDE, VIA LUNENBERG BRIDGE, TO WHITEFIELD.

Lancaster, Coos County court-house; bronze tablet set in wall, north side of entrance, marked "864 W."	863.610
Lancaster, 1 mile west of; floor of highway bridge over Connecticut River	848.0
Lancaster, 3½ miles south of; floor of bridge over stream	845.0
South Lunenberg, 4 miles north of; window sill of schoolhouse, west side of road, ⅛ mile north of stream crossing, ¼ mile north of road forks west and north	858.6
Lunenberg station, ¾ mile north of; bridge over stream	839.2
Lunenberg station, ⅛ mile north of; bridge over stream	840.1
Lunenberg station, ¼ mile northeast of; topmost point of large rock, southeast side of road	843.55
Lunenberg station, 150 feet east of water tower; top of stone between side tracks	843.5
Lunenberg station, Maine Central Railroad covered bridge over Connecticut River ("Lunenberg Bridge"); copper bolt in top of west end of south retaining wall at Vermont end of bridge, marked "846 W."	845.748
Lunenberg Bridge, ⅛ mile southeast of, on Maine Central Railroad; top of rail, iron bridge over Johns River	848.64
Scott Junction; top of rail at intersection of Maine Central and Boston and Maine railroad tracks	861.55
Whitefield, 1½ miles northwest of; top of rail at road crossing	892.61
Whitefield, ¼ mile northwest of; northwest corner of west abutment iron railroad bridge over highway	933.90
Whitefield, top of rail, Maine Central Railroad, opposite westerly line of railroad station	948.06

WHITEFIELD, ALONG BOSTON AND MAINE RAILROAD, TO TWIN MOUNTIAN, VIA WING ROAD AND BETHLEHEM JUNCTION.

	Feet.
Whitefield, McKean Block, bronze tablet set in west face of stone foundation at northwest corner of building, marked "952 W."	952.419
Whitefield Junction; top of rail opposite east side of station	950.60
Whitefield Junction, ¾ mile south of; northeast corner, top stone, southerly abutment of bridge over cattle pass	937.4
Whitefield Junction, 1 mile south of; top of rail at road crossing northeast of Burns Pond	1,014.15
Whitefield Junction, 2½ miles south of; top of rail at road crossing to Round Pond, ¼ miles south of Burns Pond	1,028.69
Wing Road, ¾ mile north of at second road crossing; top of rail	1,030.17
Wing Road, top of rail, north side of station opposite western door	1,006.85
Wing Road, 100 feet east of station, in top stone of retaining wall west side of small triangular pond between tracks, back of watertank; copper bolt, marked "1,005 W."	1,004.695
Wing Road, ½ mile southeast of, second crossing; top of rail	1,030.15
Wing Road, 1½ miles southeast of at third road crossing; top of rail	1,096.40
Bethlehem Hollow, top of rail at road crossing	1,133.75
Bethlehem Junction, 1 mile northwest of, at road crossing; top of rail	1,161.97
Black Brook, top of rail on bridge over	1,164.56
Bethlehem Junction, top of rail at north line of station	1,109.14
Bethlehem Junction, eastern side of north abutment of covered railroad bridge (Bethlehem Branch) over Ammonoosuc River; copper bolt, marked "U.S.G.S. 1108 Ft. W."	1,188.233
Bethlehem Junction, 1⅛ miles southeast of; top of rail on bridge No. 956	1,272.88
Bethlehem Junction, 2 miles east of; southeast corner of top stone of culvert	1,261.91
Twin Mountain, 2½ miles west of; top of rail on bridge No. 967 over Ammonoosuc River	1,291.60
Twin Mountain, 1½ miles west of; top of rail on covered red bridge over Little River near its confluence with Ammonoosuc River	1,337.40
Twin Mountain, 1 mile west of; top of rail at road crossing	1,352.31
Twin Mountain, top of rail opposite west line of Boston and Maine Railroad station	1,373.33

TWIN MOUNTAIN TO QUEBEC JUNCTION ALONG MAINE CENTRAL RAILROAD.

Twin Mountain, top of rail opposite Maine Central station	1,449.68
Twin Mountain, copper bolt in large bowlder west side of track of Maine Central Railroad, 10 feet north of steps leading up to Maine Central Railroad station, 42 feet north of and 30 feet west of station, marked "1439 W."	1,438.973

NEW HAMPSHIRE.

CHESHIRE AND HILLSBORO COUNTIES.

PETERBORO QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the foundation of the porch at entrance to the Town Hall, Peterboro, which is marked "P. 744." The elevation of this bench mark above mean sea level was based on top of rail in front of center of Fitchburg Railroad station, Peterboro. The best possible reduction of the profile of this railroad to mean sea level was made, resulting in an elevation

at this point of 724 feet, and in accordance with this the height of the bronze tablet is accepted as 744.470 feet.

The leveling was done by Mr. Walter R. Harper, levelman, under the general direction of Mr. Robert D. Cummin, topographer.

All bench marks dependent on this datum are marked with the letter "P." in addition to the figures of elevation.

PETERBORO TO ELMWOOD, ALONG BOSTON AND MAINE RAILROAD.

	Feet.
Tarbell, top of rail at crossing north of station	721.66
Nahors, 243 feet south of crossing, east of railroad and east of public road; copper bolt, in granite bowlder, marked "P. 691"	691.361
Cavender station, top of rail at crossing	687.84
Elmwood, northwest corner of stone foundation, west side of water tower.	685.50
Elmwood, top of rail at intersection of Nashua and Keene and Peterboro and Hillsboro branches of Boston and Maine Railroad	689.57
Elmwood, 60 feet west of station, inside of triangle formed by tracks; copper bolt, in granite bowlder, marked "692 P."	692,254

ELMWOOD VIA RUSSELLS TO EAST WILTON, ALONG BOSTON AND MAINE RAILROAD.

Elmwood, ¼ mile east of; top of rail, covered bridge over Contoocook River	688.2
South Bennington, top of rail opposite station	711.22
Otter Lake, top of capstone, north end of culvert, under track at east end of lake	829.33
Greenfield, third road crossing north of; top of rail	851.66
Greenfield, second road crossing north of; top of rail	836.11
Greenfield, first road crossing north of; top of rail	828.01
Greenfield, top of rail opposite station	827.06
Greenfield, top of ring in east side of platform south of building	827.91
Greenfield, first road crossing southeast of; top of rail	826.45
Russells, 2,000 feet northwest of station; top of rail on culvert	854.65
Russells station, top of rail at road crossing	847.92
Russells, 1,200 feet south of station and 120 feet north of crossing near schoolhouse; copper bolt set in granite capstone, west side of culvert over brook; copper bolt, marked "835 P."	838.163
Russells station, 300 feet south of; top of rail, Boston and Maine Railroad bridge No. 105	835.32
Russells, second road crossing south of; top of rail	819.82
Russells, third crossing south of; top of rail	812.23
Russells, fourth road crossing south of; top of stone west side of track	787.02
South Lyndeboro, 1 mile north of; top of rail on Boston and Maine Railroad covered bridge No. 103	758.96
South Lyndeboro, ¼ mile northwest of; top of rail on trestle bridge No. 101 over Stony Brook	719.72
South Lyndeboro, ¼ mile northwest of; top of rail overhead bridge No. 98.	689.07
South Lyndeboro, 1,200 feet north of station; top of rail at road crossing.	678 89
South Lyndeboro, back (north side) of station; highest point of granite back stone, center of church steps	652.41
South Lyndeboro, 500 feet south of station; top of rail at road crossing	639.72
South Lyndeboro, 1½ miles southeast of station; top of rail on Boston and Maine Railroad bridge No. 94 over cattle pass	541.93
Stony Brook, top of rail on Boston and Maine Railroad bridge	450.91
East Wilton, top of rail at street crossing near Whiting's Creamery	363.50

EAST WILTON VIA WILTON CENTER AND PACK MONADNOCK TO PETERBORO.

	Feet.
East Wilton, 1 mile southeast of, on road to Greenville; road surface on iron highway bridge over Souhegan River at dam	426.94
Wilton Center, ¼ mile south of, near Livermore's sawmill; copper bolt, in ledge on east side of road leading to West Wilton, 60 feet west of road to Wilton Center and 90 feet west of bridge over stream past sawmill; bolt is marked "540 P."	539.57
West Wilton; east edge of upper step at entrance to Balcom's brick store.	665.78
West Wilton, ¼ mile north of; stone at fork of road to north, by signpost "9 miles to Peterboro"	902.14
West Wilton, 1¼ miles northwest of, on Peterboro road; stone at road south, opposite farmhouse	902.14
Peterboro, 6¼ miles east of; surface of bridge over stream flowing northeast; this is the first stream crossing east of road going south to Temple and northwest to Peterboro	979.3
Pack Monadnock Gap; ⅛ mile east of highest point in road; top of stone at fork of roads to Wilton and Temple	1,284.00
Pack Monadnock Gap; summit of road between Peterboro and Wilton	1,486.00
General Miller Park, top of stone at road to	1,474.18
Peterboro, 1½ miles southeast of; stone at schoolhouse, in northwest corner of road opposite Shattuck's ice house	919.51
Peterboro; Pine street, opposite Amos Sawyer's house; staple in southernmost of two stone hitching posts	804.90

PETERBORO, VIA FITCHBURG RAILROAD, TO ONE-HALF MILE NORTH OF CHESHIRE MILLS, THENCE TO WILDER VILLAGE.

Peterboro. top of rail opposite Fitchburg station	724.00
Peterboro, town hall; cross mark on bronze tablet set in north face of easternmost of two square-dressed granite blocks in foundation supporting porch of entrance to building; tablet is marked "744 P."	744.470
Noone, top of rail, road crossing north of station	767.40
Noone, first culvert under railroad south of station; spike in west side	766.39
Durie, top of east rail at station platform	811.62
Hadleys, top of rail at road crossing north of station	896.51
Hadleys, ¼ mile southeast of; railroad bridge over Contoocook River, iron bridge; south side of east end of bridge	899.83
Hadleys, second road crossing south of; top of rail	925.53
Hadleys, third road crossing south of; top of rail	930.71
Hadleys, 1 mile south of and ⅛ mile northeast of Cheshire Mills; floor of highway bridge over Contoocook River at intersection of road west, past schoolhouse and up steep hill, and road east through woods to Boston and Keene road	928.6
Boston and Keene road, ¼ mile north of Squantum, at schoolhouse; top of large stone, southwest corner of roads	1,118.61
Boston and Keene road, ¼ mile east of schoolhouse and of Squantum-Peterboro road crossing; top of large flat rock, south side of road opposite large red brick house on north side of road	1,129.94
Boston and Keene road, 1⅛ miles west of Wilder Village; top of stone under northwest corner of porch of small white house south side of road.	1,207.13
Boston and Keene road, 1 mile west of Wilder Village, at road north to Sharon Springs and Peterboro; surface of bridge over stream in swamp 625 feet east of road corner	1,157.1
Wilder Village, 110 feet west of Simon Rolfe's house, 180 feet north of Boston and Keene road, at intersection with Sharon road and Peterboro road; copper bolt, in granite bowlder in field, marked "1185 P."	1,187.200

WILDER VILLAGE, VIA NEW IPSWICH AND HIGH BRIDGE, TO GREENVILLE.

	Feet.
Wilder Village, 1,000 feet east of Sharon-Peterboro roads; road surface on bridge over small stream flowing southwest	1,173.5
Wilder Village, 1 mile east of, and 100 feet east of road southwest to Rindge; floor surface of small bridge over brook	1,236.24
Wilder Village, 2 miles east of, 220 feet west of house on south side of road; top of large stone north side of Boston and Keene road	1,349.70
Boston and Keene road and Gilson avenue, 100 feet west of intersection of; highest point on stone, south side of road	1,354.50
New Ipswich, ¼ mile west of, at road northwest to Temple; capstone of culvert 150 feet west of road intersection	1,221.75
New Ipswich, post-office and store; northeast corner of lower step at east entrance	978.84
Furnace Brook, surface of bridge on Boston and Keene road, 250 feet east of road to Bank Village	926.61
High Bridge, surface of stone bridge known by that name in the factory village of same name, 150 feet south of mill, and carrying Boston and Keene road over Souhegan River	921.95

GREENVILLE TO EAST WILTON.

Greenville, town hall; crossmark on bronze tablet set in west face of cut granite foundation stone, 1 foot north of southwest corner of building and 2½ feet above concrete pavement, marked "831 P."	830.618
Greenville, ¾ mile north of, on Fitchburg Railroad; top of rail center of trestle bridge over Souhegan River, 102 feet above water surface	809.80
Greenville, 1 mile north of, on road to Wilton; stone culvert over stream flowing west	734.2
Greenville, 1½ miles northeast of; surface of stone-arch bridge over Souhegan River	621.4
Greenville, 2 miles northeast of; surface of bridge over brook just south of road going west toward Peterboro	581.5
Greenville, 3 miles northeast of; surface of bridge over brook flowing east.	525.3
West Wilton, 700 feet southwest of road to; surface of bridge over brook.	475.
East Wilton, 2½ miles southwest of; iron bolt in northeast corner of framework of hay scales at fork of roads to West Wilton and Greenville.	466.95
Carroll, public road crossing ¼ mile north of; top of rail	1,389.53
Cherry Mountain water tank, 180 feet south of; top of rail at public road crossing	1,313.27
Quebec Junction, top of rail opposite westerly line of freight house	1,144.60

NEW YORK.

ERRATA IN PREVIOUS REPORT.

In the Eighteenth Annual Report of this Survey, Part I, the following errata occur in the published elevations listed under the title "New York":

Page 276, fifteenth line from bottom, should read:

Checkered Tavern Cross Roads, 1½ miles east of Ridge post-office; nail in old stump at southwest corner of road intersection	409.27

Page 277, fifteenth line from top, published elevation should read: 1,457.458.

Page 277, fourth line from bottom, should read:

Marked "U. S. G. S. B. M. 1,440 ft." 1,437.800

In addition to elevations determined in the State of New York and published in the following list, there were run many miles of levels in Herkimer and Hamilton counties on Old Forge and McKeever quadrangles, also in Cattaraugus County on Salamanca quadrangle, which are reserved for publication in the next annual report. This is because of plans completed for the running of additional level circuits and precise-level lines which will reduce these elevations to a more accurate mean sea-level datum.

PRECISE LEVELS.

The following factors are those employed by the United States Geological Survey in correcting the elevations of the bench marks of the State canals, as published in reports of the State engineer and surveyor, and the bench marks of the line of levels run by the United States Engineer Corps from Albany to Oswego, as published in Professional Papers No. 24, Corps of United States Engineers.

The elevations published by the Corps of Engineers are based on the old Gristmill bench mark established by the United States Coast and Geodetic Survey at Greenwich, opposite Albany, N. Y., the height of which was determined by precise levels run from Sandy Hook in 1877 as being 14.73 feet above mean sea level. The elevations published by the State engineer of the various bench marks on the line of the canals are based on mean low water at Albany. A connection has been made between State canal bench marks and United States Engineer Corps bench marks at Lock No. 1, and the difference between the two is +1.18 feet. In other words, this amount added to the State canal elevations reduces them to mean sea level as accepted by the United States Engineers and published in Professional Papers No. 24.

In 1893 to 1895 Assistant C. H. Van Orden, of the United States Coast and Geodetic Survey, ran two lines of precise levels, one from mean sea level at Boston and the other from mean sea level at Sandy Hook, both connecting with the old Gristmill bench mark, the former making its elevation 14.07 feet and the latter making it 13.22 feet. The United States Coast and Geodetic Survey has discarded the old elevation, 14.73 feet, and now accepts for the elevation of the Gristmill bench mark the mean of the two lines of levels run between 1893 and 1895, giving for that bench mark the value 13.64 feet above mean sea level at Sandy Hook. This is the value for the Gristmill benchmark, accepted also by the United States Geological Survey.

Connection has been made between the levels of State canals west of Rome with the benches of the United States Engineer Corps at Charlotte and Oswego. The latter was done with the greatest care, and as a result the canal levels were found to be 0.641 foot below those of the Engineer Corps.

In order, therefore, to reduce the elevations of the State canals, as published by the State engineer and surveyor, to mean sea level at Sandy Hook, as obtained from the more recent precise levels and the connections at Oswego, the value of 0.1 foot must be added to all such published elevations of bench marks east of Higginsville and the value 0.444 foot must be subtracted from all published elevations of the State canal bench marks west of Higginsville.

To reduce the published elevations of the United States Engineer Corps to mean sea level at Sandy Hook in accordance with the more recent precise levels of the United States Coast and Geodetic Survey, the value of 1.085 must be subtracted from all elevations of bench marks published in Professional Papers No. 24.

LAKE CHAMPLAIN, NEW YORK, AND ST. LAWRENCE RIVER, CANADA.

The following bench marks are dependent on mean sea level at Sandy Hook, as brought by the Coast Survey levels of 1894–95 to the Gristmill bench mark, Albany, accepted here as 13.640 feet above mean sea level; also by precise levels of Coast Survey to Putnam Station, Lake Champlain, and by tidal levels of the Coast Survey to various points on Lake Champlain. The levels north of Rouses Point and Fort Montgomery are from the precise levels of the Canadian department of public works, as based on the United States Coast Survey and Engineer Corps bench marks on Fort Montgomery obtained as above.

	Feet.
Rouse Point, New York. Bench mark is a cross and circle cut in stone watersill of Chapman's Block, on north side of building, about 15 feet from northeast corner	108.97
Fort Montgomery, New York. Bench mark is heel of loophole of Bastion A.	104.541
Fort Montgomery, New York. Bench mark is level of base course of scarp wall of left reentrant angle of Bastion B at the outer end of the Lake Postern	94.945
Lake Champlain, mean water level	96.085
Fort Montgomery, New York. Zero of Engineer Corps gage	93.445
Sorel (junction Richelieu and St. Lawrence rivers). Bench mark is copper plug in stone basement of Sorel Market House, 21 feet east of southeast corner and about 3½ feet above ground, marked $B \ominus \frac{C}{XXVI} M$	40.730
Montreal. Bench mark is copper plug in southern wall of custom-house near northwest corner of Commissioner and Port streets	49.5373
Lachine. Bench mark is copper plug in third course of stone above foundation, front of buttress, southeast corner of Roman Catholic parish church, Lachine Village	83.3546

GENESEE AND MONROE COUNTIES.

BROCKPORT AND HAMLIN QUADRANGLES.

The elevations published in the following list are based on a bronze tablet set in the foundation wall of the Normal School at Brockport and marked "B 538." The elevation of this bench mark above mean sea

level is derived from the nearest bench mark of the State canals. As reduced in accordance with the latest information, the height of this bench mark is accepted as 538.210 feet above mean sea level. The elevations accepted for and stamped on the bench marks of this season are nearly 2 feet lower than those stamped on the adjacent bench marks placed during last season, and for this reason the change in datum was made from Lockport to Brockport. The published elevations of the previous season are, however, in accord with these published here.

The leveling was done under the direction of Messrs. J. H. Jennings and E. B. Clark, topographers, by Mr. E. L. McNair, levelman.

All bench marks dependent on this datum are marked with the letter "B" in addition to the figures of elevation.

BROCKPORT TO HAMLIN.

	Feet.
Brockport, west side of street at northwest corner of intersection of streets in front of house of J. Minot; chiseled square on sidewalk slab at gate.	498.4
Brockport, Normal School; bronze tablet in foundation wall in front of office, marked "B 538"	538.210
Clarkson, ½ mile south of; stone horse block opposite small yellow house on west side of road, chiseled square	449.24
Clarkson; chiseled square on granite bowlder near southwest corner of Hixson's brick store at northeast corner of intersection of roads	427.24
Clarkson, 0.9 mile north of; chiseled square on top of bowlder in line with row of maple trees west of road in front of red barn north of white house	379.16
Clarkson, 2 miles north of, at stream crossing; chiseled square on south abutment of bridge	353.72
Clarkson, 2.8 miles north of; hard-head bowlder in fence line west of road, 15 feet south of small stream and opposite bridge over same; chiseled square	344.35
Hamlin, 0.9 mile south of; chiseled square on stone abutment southwest corner of small iron bridge	333.10
Hamlin, Hamlin House, 6 feet from southwest corner of; iron post set in ground inside fence, marked "B 337"	336.677
East Hamlin, 0.4 mile north of corner which is 1.6 miles east of; floor of iron bridge	274.9
Hamlin, top of rail at road crossing Rome, Watertown and Ogdensburg Railroad	306.7

HAMLIN TO HILTON.

Hamlin, 0.8 mile north of, at forks of road; chiseled square on large bowlder north end of stone wall, west side of road	306.23
Hamlin, 1.3 miles north of, at intersection of roads at schoolhouse; chiseled square on bowlder in west end of stone wall at northeast corner of roads	305.29
Hamlin, 2.11 miles northeast of; chiseled square on hard-head bowlder beside barnyard fence, 200 feet west of brick house on north side of road.	308.91
Hamlin, 3.2 miles east of; chiseled square on granite bowlder north of road nearly opposite white house; there are numerous bowlders just west of bench march and an orchard on the north	282.75

	Feet.
Hamlin, 4.2 miles northeast of, and 1 mile north of East Hamlin; chiseled square on granite bowlder just outside of fence in front of brick house on northwest corner of road intersection	289.42
East Hamlin, 2.4 miles northeast of; chiseled square on bowlder under maple tree in front of wood-colored house on north side of road at bend to southeast	289.59
Hilton, 2.5 miles northwest of; chiseled square on western of two large bowlders close together on north side of road opposite road from the south	288.55
Hilton, ½ mile north of, at "Bartletts Corners;" chiseled square on bowlder in grass triangle at southeast corner of road intersection; a cobblestone church on northeast corner	276.48
Hilton, North Parma Hotel, northeast corner of; chiseled square on paving stone 2 feet from telegraph pole	280.65
Hilton, house of Dr. J. J. Williams; bronze tablet set in foundation wall under bay window, marked "B 284"	284.219

HILTON TO SPENCERPORT.

Hilton, 1.4 miles south of; at North Parma; chiseled square at southwest corner of stone walk in front of house on northeast corner of road intersection	298.84
Parma Center, 250 feet south of store; chiseled square on large round bowlder near footpath on west side of road	344.11
Parma Center, 0.9 mile south of; chiseled square on bowlder northeast corner of road intersection at house without blinds	351.67
Parma Center, 2.1 miles south of; chiseled square on hard head bowlder in old fence line on west side of road nearly in front of a light-gray house with light-blue blinds	367.85
Parma Corners, chiseled square on flat stone at northwest corner of building standing on the southeast corner of intersection of Ridge road	433.52
Spencerport, Amity street; lower step of west wing of westernmost of two canal bridges (this is Erie Canal bench mark)	512.65
Spencerport, Amity street; Canal bridge No. 99; bronze tablet in center of abutment facing towpath and canal, marked "514 B"	513.700
Spencerport, New York Central and Hudson River Railroad station; southeast corner of doorstep at east end of building	527.91
Spencerport, base of rail at east end of New York Central and Hudson River Railroad station	524.8

BROCKPORT TO SWEDEN.

Brockport; Erie Canal bench mark No. 107 on lower step, east end, towpath abutment of Park Avenue Canal bridge	510.669
Brockport, Park avenue and South street; top of spindle of hydrant	530.23
Brockport, MacLachlan's coal yard; chiseled cross on sandstone in front of office	544.17
Brockport, chiseled cross on sandstone about 75 feet south of hydrant on west side of Main street, near top of hill, ¼ mile south of railroad	557.39
Brockport water tower; chiseled square on stone foundation, west side	606.81
Brockport, 1 mile south of; chiseled square in stone horse-block step in front of white house west side of road at top of hill opposite cemetery	686.99
Brockport, 4.6 miles west of; on northeast corner of coping northwest abutment of New York Central and Hudson River Railroad bridge No. 136	527.89
Brockport, ½ mile east of; white paint mark on corner of coping east side New York Central and Hudson River Railroad stone culvert No. 125, south side of track	533.51

SWEDEN TO BERGEN.

	Feet.
Sweden Center, chiseled square on bowlder on west side of road in front of first house north of brick church	667.74
Sweden Center, 0.7 mile south of; chiseled square on limestone ledge west side of road 50 feet from small wooden bridge and 400 feet south of stone house	618.55
Sweden Center, 1 mile south of; chiseled square on bowlder at northwest corner of intersection of roads	634.97
Sweden Center, 1 mile south of, at George H. Way's residence; bronze tablet in foundation wall under bay window, marked "639 B."	639.170
Bergen, 1¼ miles north of; on abutment west side south end of bridge over Black Creek	574.7
Bergen, West Shore Railroad crossing; top of rail	579.4
Bergen, New York Central and Hudson River Railroad station, top of rail.	603.1
Bergen, New York Central and Hudson River Railroad station; bronze tablet, set in doorstep of baggage room, marked "604 B"	603.938

SOUTHWARD FROM CHILI STATION ON NEW YORK CENTRAL RAILROAD.

Chili, water-pass abutment on line of New York Central and Hudson River Railroad, 9,200 feet east of station	563.76
Chili station, 380 feet east of; bronze tablet, set in south end of old culvert abutment at southwest corner of flagman's shanty, south side of main line New York Central and Hudson River Railroad, marked "561 B"	561.154
Chili station, 1.2 miles south of; chiseled square on stone abutment northwest corner of iron bridge over Black Creek just south of Buckbees Corners	534.99
Chili station, 2 miles south of; chiseled square on bowlder north side of driveway leading into barn on west side of road 150 feet south of white house	565.14
Chili station, 2½ miles south of, and 1½ miles south of Buckbees Corners; bronze tablet, in foundation wall under southeast corner of dwelling house of John Groves on west side of road, marked "558 B"	558.450

CHURCHVILLE TO ADAMS BASIN.

Churchville, New York Central and Hudson River Railroad station; base of rail opposite center of building	567.5
Churchville, ½ mile north of; floor of iron bridge over Black Creek	565.1
Churchville, top of rail, West Shore Railroad crossing	568.6
Adams Basin, eastern doorsill of railroad station	524.52
Churchville, Union School building; bronze tablet at right side of main entrance, marked "615 B"	614.612
Churchville, New York Central and Hudson River Railroad station, 800 feet east of; west abutment New York Central and Hudson River Railroad bridge No. 721 (railroad company's bench mark)	563.55
South Chili, 0.7 miles west of, on road to Riga Center; red mark on rock at road intersection	607

ONONDAGA, MADISON, AND CORTLAND COUNTIES

CAZENOVIA AND TULLY QUADRANGLES.

The elevations in the following list are based on a copper bolt, which is Erie Canal bench mark No. 82 and is set in the southwest corner of the stairway landing pier of the west towpath stairs of the Geddes Street bridge in Syracuse. The elevation of this bench mark is accepted

as 405.772 feet above mean sea level, as reduced from the latest information relative to precise and State canal levels. The elevations stamped on the bench marks of this season are about 2 feet lower than the stamping on adjacent bench marks of the work done during the previous season, owing to corrections in datum as brought through by precise levels from Sandy Hook. The elevations stamped during the past season, however, agree with the published elevations of the previous season, as well as with those published herewith.

The leveling was done under the general direction of Messrs. W. M. Beaman, C. C. Bassett, and A. M. Walker, topographers, by Mr. Clark Brown, levelman.

All elevations dependent on this datum are marked with the letter "S," in addition to the figures of elevation.

SYRACUSE TO SUMMIT, VIA ONONDAGA VALLEY, CARDIFF, AND TULLY.

	Feet.
Syracuse, Geddes Street bridge; Erie Canal bench mark No. 82, copper plug at southwest corner of stairway landing, pier at foot of west towpath stairs	405.772
Syracuse, Grand avenue and Geddes street; top of fire hydrant	405.13
Syracuse, Delaware, Lackawanna and Western Railway station; top of rail	388.81
Syracuse, Onondaga avenue, east side of, and 200 feet south of Leavenworth fountain; top of fire hydrant	405.59
Syracuse, West Colvin Street bridge over Onondaga Creek; north end of west abutment, northwest corner of top stone; square chiseled mark	405.06
Syracuse, southwest corner of West Colvin and South Salina streets; top of fire hydrant	418.23
Syracuse, northeast corner of South Salina street and Matson avenue; chiseled cross on stone monument	417.83
East Onondaga; copper bolt set in coping of northwest wing of bridge over Onondaga Creek, marked "S. 422"	421.649
East Onandaga, 1.1 miles south of; chiseled square on center of east coping highway culvert	436.61
Onondaga Castle, ½ mile north of; nail in root of maple tree 18 inches in diameter southeast corner of road to east	469.50
Onondaga Castle, 30 feet north of hotel, 30 feet east of road; chiseled square on well curb	519.34
Onondaga Castle, ½ mile south of; base of one-chimney house east of road, middle of hill descending south	484
Onondaga Indian Village, opposite Six-mile post; nail in root of 3-foot sycamore tree 40 feet south of brook by west road fence	447.64
Onondaga Indian Village, 600 feet south of road leading to west in north end of village; bench mark on basswood tree 3 feet in diameter	453.16
Castle Creek, iron bridge; top of southwest anchor bolt	468.70
Onondaga Indian Village, ¼ mile south of road leading to South Onondaga, 900 feet south of cemetery and 40 feet south of small brook; copper bolt, in bowlder, 3 feet from west road fence, and marked "S. 469"	468.195
Eight-mile post, 2,500 feet south of, on top of small hill; chiseled square on north edge of rim of casing of water-pipe valve, 12 feet inside of west road fence	510.08
Nine-mile post, 20 feet south of, east side of road; root of elm tree 2½ inches in diameter	489.76
Solvay water tank, west side of road, opposite tank; chiseled square on north side of rim of valve casing	567.04

	Feet.
Ten-mile post, 10 feet north of, on east side of road; chiseled square on bowlder 3 feet broad	590.54
Ten-mile post, ¼ mile south of, 300 feet north of white house, east side of road; chiseled square on east edge of rim, point of valve case of Solvay water pipe	613.82
Cardiff, ⅛ mile east of road, back of hotel, 75 feet south of brook; bowlder 6 feet broad and 2 feet high; copper bolt, marked "S. 676"	675.652
Cardiff, 250 feet north of cemetery, on east side of road; nail in top of stump between road and sidewalk	604.44
Cardiff, 1 mile south of, 400 feet south of Sulphur Well Brook bridge, and about 100 feet south of house; chiseled square on outcrop 5 feet west of road	574.15
Tully Valley, 0.3 mile north of crossroads, 25 feet south of bridge; nail in root of elm tree by west road fence	568.29
Tully Valley, 40 feet north of crossroads; nail in root of maple tree by east road fence	604.79
Salt Wells, first summit in road north of; chiseled square on south side of rim of casing of water-pipe valve	637.64
Tully Valley, 50 feet north of schoolhouse, 10 feet east of road; chiseled square on bowlder	648.50
Tully Valley, south end of; bench mark on fire hydrant opposite white barn east of road, 40 feet south of first telegraph pole	740.08
Tully Valley, south end of, 700 feet north of road west to Vesper, 500 feet south of curve in road, on bowlder in southwest corner of barnyard, west side of road; copper bolt, marked "S. 819"	819.047
Tully Hillside, 20 feet northeast of first house on west side of road south of salt derricks; bowlder 6 feet broad, chiseled square	962.62
Tully Hill, 100 feet south of house at top of; nail in root of 15-inch elm tree by east road fence	1,266.40
Tully Center, 300 feet east of crossroads; nail in stump 14 inches in diameter, south of road in front of barn	1,252.36
Tully, 200 feet north of Hotel Slayton; in water table of brick house on west side of road, at southeast corner, front of house, cross mark on bronze tablet, marked "1251 S."	1,251.092
Tully, east side of road leading north, opposite Hotel Slayton; fire hydrant near crossroads	1,247.46
Tully, ¼ mile east of, 125 east of road south; nail south side of large maple tree inside of fence on south side of road	1,298.85

SUMMIT TO JAMESVILLE VIA ONATIVIA.

Summit, ¼ mile north of; nail in top of pine stump 700 feet north of road to north, east of five pine trees in row north side of road	1,289.26
Summit, ½ mile north of; chiseled square in flat bowlder 10 feet east of road, 10 feet north of schoolhouse	1,273.26
Summit, 1 mile north of, on road to Syracuse, 500 feet north of white house on west side of road, 125 feet north of road summit; copper bolt, in bowlder, marked "1292 S."	1,291.904
Onativia, 1¼ miles south of; face corner of parapet, west end, north abutment, 20-foot span farm bridge	1,088.42
Onativia, engine water column at railway station; top of anchor bolt in northwest corner of base plate	991.68
Jamesville, 5½ miles south of, 200 feet north of post marked "12 M. to Syracuse," opposite sawmill; face corner, north end of retaining wall to railroad embankment	882.17

	Feet.
Jamesville, 2 miles south of; 20-foot span cattle pass, north abutment, east end, face corner of parapet 400 feet north of road crossing Delaware, Lackawana and Western Railway	708.27
Jamesville, ¾ mile south of, at east end of reservoir dam, in coping; cross mark on bronze tablet, marked "S. 645"	644.983

SUMMIT TO DELPHI VIA APULIA AND FABIUS.

Apulia, 300 feet west of schoolhouse, 60 feet west of dwelling, 15 feet from north road fence, 10 feet from wagon track; chiseled square on bowlder.	1,294.13
Apulia, ¼ mile east of; northeast corner of road to northeast, second maple tree, 15 inches in diameter, nail in root	1,302.93
Apulia, 1 mile east of; ¼ mile east of cemetery and 150 feet west of house; chiseled square on bowlder in north road fence	1,294.04
Fabius, 1 mile west of, 50 feet west of summit, 20 feet south of road; nail in root of 18-inch basswood tree	1,347.50
Fabius, ¾ mile west of, southeast corner of cross roads; chiseled square on large bowlder 75 feet from intersection	1,302.16
Fabius, ½ mile north of; highest point of flange on upstream end of tile culvert	1,248.74
Fabius, 100 feet west of crossroads, Main and Cemetery streets, in wall under west window of flat-roofed frame house; cross mark on bronze tablet, marked "1284 S."	1,284.036
Delphi, 2 miles west of; block school 25 feet west of crossroads, 5 feet south of road; chiseled square on flat bowlder	1,397.27
Delphi, 100 feet west of Main street, 5 feet north of east and west street, in edge of turn around northwest of quadrant; chiseled square on bowlder	945.09

DELPHI TO JAMESVILLE VIA ORAN AND MANLIUS.

Delphi, 3 miles north of, at crossroads, at east side of Limestone Creek valley; nail in root of maple tree northeast corner of road intersection.	806.25
Oran, 1½ miles southeast of, and 1½ miles southeast of railroad crossing of Cherry Valley turnpike, 500 feet northwest of rock cut; chiseled square on north coping of cattle pass	1,091.52
Oran, 1 mile southeast of, about 300 feet south of fork of road opposite long red barn; notched root, west side of 15-inch maple tree on west edge of road	889.65
Oran, 300 feet west of church, 20 feet north of road, in prominent bowlder; copper bolt, marked "S. 793"	793.148
Buellville, 400 feet northwest of schoolhouse, 15 feet north of road; chiseled square on bowlder	761.16
Manlius, northeast corner Seneca and Franklin streets; top of fire hydrant.	601.99
Manlius, on road to Fayetteville, 50 feet south of fork of road to High Bridge; fire hydrant	600.10
Manlius, 1½ miles northwest of, at High Bridge, double arch bridge over Limestone Creek, in coping 5 feet from end of southwest wing; copper bolt, marked "S. 507"	507.027
Jamesville, near Dunlap Mills; fire hydrant 100 feet west of bridge and 20 feet south of road	548.74
Jamesville, 1 mile northwest of, bowlder 6 feet south of railroad track at overhead crossing, 30 feet east of highway bridge; chiseled square	586.90

FAYETTEVILLE TO ERIE CANAL.

Fayetteville, 100 feet west of Limestone Creek bridge; southwest corner of streets, fire hydrant	437.33
Erie Canal, Limestone Creek aqueduct; southwest coping parapet on west wing, towpath side (canal bench mark No. 70); copper bolt	433.666

FABIUS TO CUYLER VIA KEENEYS SETTLEMENT.

	Feet.
Fabius, ¼ mile south of, 175 feet north of road to west; chiseled square on bowlder east side of road	1,256.93
Fabius, 1¼ miles south of; nail in root of basswood tree west side of road opposite house	1,252.47
Fabius, 1¾ miles south of, iron bridge, east end, south abutment; chiseled square	1,229.18
Keeneys Settlement, ¼ mile north of, 300 feet north of house, flat bowlder 5 feet broad, 10 feet west of road; chiseled square	1,225.61
Keeneys Settlement, 500 feet east of schoolhouse, iron bridge, top stone northeast wing; chiseled square	1,208.72
Cuyler, about 2 miles north of, in front of one and one-half story white house on east side of road; nail in top of large pine stump 20 feet south of large pine tree	1,215.55
Cuyler, 1¼ miles north of, 600 feet north of yellow barn on west side of road; nail in root of large crooked triple-trunk elm tree, 2½ feet in diameter, on west side of road	1,200.23
Cuyler, 1 mile northeast of; chiseled square near end of northeast wing of iron bridge over Tioughnioga Creek	1,205.75

CUYLER TO DERUYTER RESERVOIR, VIA DERUYTER.

Cuyler, ¼ mile east of; 500 feet east of north and south road, 4 feet south of Lehigh Valley Railroad track; copper bolt, in bowlder, marked "1256 S."	1,256.750
Cuyler, ¼ mile south of; 500 feet east of north and south road, 4 feet south of Lehigh Valley Railroad track, in same bowlder as described in last above; railroad bench mark No. 86′′′, iron bolt	1,256.95
Cuyler, 2 miles northeast of; 300 feet west of trestle, 600 feet west of schoolhouse, 20 feet north of railroad track; railroad spike driven in side of 18-inch maple stump	1,305.93
Deruyter, 1¼ miles west of; ¼ mile east of schoolhouse, 100 feet north of railroad crossing, 20 feet north of farm crossing; railroad spike driven in root of maple tree 2 feet in diameter (railroad bench mark No. 88′)	1,306.80
Deruyter, foundation of water tank; iron bolt set in coping side next to railroad track	1,284.17
Deruyter, ¼ mile north of; intersection of Fabius and Cazenovia roads; nail in root of maple tree 2½ feet in diameter in fork of road	1,289.45
Deruyter, 1½ miles north of; 20 feet south of iron bridge on west side of road; limestone bowlder marked with chiseled square	1,329.83
Deruyter, 2 miles north of; iron bridge on road to reservoir, east end, south abutment, chiseled square on corner 1½ feet below bridge seat	1,304.70
Deruyter, 2¾ miles north of; iron bridge over feeder to Deruyter reservoir, southeast wing, south corner; chiseled square	1,317.94
Deruyter reservoir dam, west end of dam, south parapet of spillway arch, east end, face corner of coping; copper bolt marked "1286 S."	1,286.088

DERUYTER TO ERIEVILLE, VIA SHEDS CORNER AND GEORGETOWN.

Deruyter, 2½ miles north of; railroad bench mark No. 92, ¼ mile east of Reservoir road, opposite old sawmill, railroad culvert, south parapet; iron bolt set in lead	1,318.59
Sheds Corner station, 1 mile south of; 1 mile east of Reservoir road, 700 feet east of road crossing, 200 feet west of short deep cut; railroad spike in root of large elm on south bank of creek	1,334.35
Sheds Corner station, railroad bench mark No. 94, 600 feet south of Tioughnioga Creek Railroad bridge, north abutment, west end, parapet; iron bolt set in cement	1,385.55

	Feet.
Sheds Corner station, 600 feet south of; railroad bridge over Tioughnioga Creek, bridge seat, west end, south abutment; copper bolt, marked "1383 S."	1,383.86
Sheds Corner, iron bridge near church; nail in top of 12-inch pile at east end of north abutment	1,414.34
Sheds Corner, 1 mile southeast of; northwest corner of road west; nail in root of maple tree 3½ feet in diameter	1,476.85
Sheds Corner, 1¾ miles southeast of; northeast corner of road east; nail in root of elm tree 2½ feet in diameter	1,538.69
Tioughnioga Creek, ¼ mile southeast of; wild black cherry tree 50 feet from fork of road in angle; nail in notched root	1,609.15
Georgetown, 2 miles northwest of, opposite sawmill; nail in root of cherry tree 2½ feet in diameter, 10 feet east of road	1,592.76
Georgetown, 1¼ miles northwest of, on road to Sheds Corners, 75 feet north of road to Erieville, 20 feet north of brook, 15 feet west of road, 4 feet east of road fence; iron bench-mark post, with bronze cap marked "S. 1538."	1,538.276
Erieville, 3 miles south of, and 1 mile north of railroad, at summit of hill; nail in root north side of maple tree, east side of drive to house, 20 feet north of road	1,764.83
Erieville, 1¼ miles south of; 500 feet north of 30-mile post; nail in root of large elm tree 20 feet west of track	1,624.85
Erieville, railroad bridge over road south of; chiseled square on top stone, south end, west abutment	1,618.63
Erieville, railroad culvert at station; chiseled square northeast corner of coping, east end	1,569.58

ERIEVILLE TO ORAN, VIA NELSON, FENNER, AND CAZENOVIA.

Erieville Reservoir gatehouse, 6 feet west of door; copper bolt in projection of bottom course, marked "1473 S."	1,473.647
Erieville, 2 miles north of; 300 feet southwest of houses and south of three large elm trees; nail in root of 30-inch elm near east road fence	1,447.95
Nelson, 1½ miles south of; notch in root of maple tree 20 feet east of road, opposite northeast corner of cemetery	1,536.35
Nelson, ¾ mile south of, north of summit; chiseled square on bowlder, west edge of road	1,541.90
Nelson, 500 feet south of crossroads; chiseled square on face corner of bottom stone, east end, north abutment of bridge	1,431.78
Nelson, 1 mile north of; 400 feet north of road to west, opposite barn on west side of road; bowlder 10 feet east of road, marked with chiseled square	1,450.88
Nelson, 1¼ miles north of, at crossroads; chiseled square on bowlder at northeast corner of road	1,433.67
Fenner, 1 mile south of and 1,000 feet north of Peterboro turnpike, 150 feet south of orchard, 75 feet west of road; in outcrop; copper bolt marked "1466 S."	1,467.080
Fenner, 1¼ miles south of, at crossroads; notched root of 30-inch elm in southwest corner	1,466.94
Cazenovia, 2¾ miles east of; southeast corner of road to southeast; chiseled square on bowlder	1,403.50
Cazenovia, 942 feet south of Lehigh Valley Railroad depot; railroad bench mark No. 103; iron pin in northwest corner of north abutment	1,187.18
Cazenovia, chapel building of seminary; water table under pilaster at east side of door, south entrance of chapel; crossmark on bronze tablet marked "S. 1246."	1,246.859

	Feet.
Cazenovia, West Shore Railroad pumping station; foundation of water tank, north pedestal next to track; chiseled square	1,196.46
Cazenova, 1¼ miles northwest of West Shore Railroad depot, in schoolhouse grounds; nail in root of 3-foot elm tree, 40 feet south of school	1,328.39
Cazenovia, 2 miles northwest of West Shore Railroad depot, over tunnel; highest point of stone monument 40 feet north of road	1,264.61

ONEIDA, HERKIMER, AND HAMILTON COUNTIES.

REMSEN AND WILMURT QUADRANGLES.

The elevations published in the following list are based on a bronze tablet set in the north end of the retaining wall between the lower milldam and the Rome, Watertown and Ogdensburg Railroad in Remsen, and marked "R. 1172." The elevation of this bench mark above mean sea level is obtained from the elevation of the permanent bench mark established at South Trenton during the preceding field season, the height of which is accepted as 804.368 feet above mean sea level, as reduced in accordance with the latest information through precise leveling to Albany from Sandy Hook and the levels of the State canals. In accordance with these connections the elevation of the Remsen bench mark is accepted as 1,171.873 feet above mean sea level. The datum was changed to Remsen from that of Utica, accepted for adjacent leveling of the preceding season, because the bench marks established on the Utica quadrangle are stamped 2 feet higher than those established during this season, though the elevations of these Utica bench marks were published in accordance with the latest corrections and on the same datum as are the elevations published herewith.

The leveling was done under the general direction of Mr. W. H. Lovell, topographer, by Mr. E. L. McNair, levelman.

All bench marks dependent on this datum are marked with the letter "R" in addition to the figures of elevation.

TRENTON VIA PROSPECT, HINCKLEY, NORTHWOOD TO NEAR WILMURT, AND THENCE VIA OHIO TO COLDBROOK.

	Feet.
South Trenton, ½ mile north of; chiseled square on bowlder, west side of road 20 feet south of large elm tree	826.95
Trenton, 0.78 mile south of; chiseled square on stone step in front of porch of new house at southwest corner of intersection of roads	796.01
Trenton, Rome, Watertown and Ogdensburg Railroad station; water table 0.42 foot west of door jamb, south door of waiting room	841.07
Trenton, 0.7 mile north of station; top of iron bolt in top of northernmost of two stone hitching posts 25 feet apart on west side of road and opposite road turning east	798.05
Trenton, 1.1 miles north of station; iron bolt in top of easternmost of two stone hitching posts 50 feet apart north side of street on road to Prospect	780.61
Trenton, 2 miles north of station; chiseled square on east end of stone wall in front of white house on north side of road	870.60
Prospect station, Rome, Watertown and Ogdensburg Railroad crossing over highway just north of; chiseled square on lower step of south abutment, east side	985.35

	Feet.
Prospect station, Rome, Watertown and Ogdensburg Railroad, 0.4 mile north of; chiseled square on granite bowlder north side of road 340 feet east of Mohawk and Malone Railroad crossing	1,086.76
Prospect, iron bolt in top of stone hitching post in front of post-office opposite street going east to Hinckley	1,188.47
Prospect post-office, 0.22 mile north of; copper bolt in large bowlder 3 feet high, 12 feet long, and 7 feet wide, in field opposite creamery and east of road; bolt is marked "1142 R."	1,141.520
Prospect, 0.4 mile east of; chiseled square on bowlder north side of road 22 feet from corner of red-painted building (pump factory)	1,210.29
Prospect, 1.3 miles east of; chiseled square on lower step, in line of stone wall in front of white house on north side of road	1,216.20
Hinckley, ¼ mile west of Empire Hotel; chiseled square on east end of wall of stone culvert north side of road	1,181.45
Hinckley, 0.6 mile east of Empire Hotel; chiseled square on small bowlder deeply embedded in ground west side of road close to wagon track	1,194.43
Hinckley, State bench mark west of road painted "B. M. No. 63"	1,183.29
Hinckley, 2 miles north of; chiseled square on small bowlder east side of road close to two maple trees	1,254.77
Hinckley, 2.3 miles northeast of and about 1.1 miles west of Oneida-Herkimer County line, in Remsen Township; copper bolt in bowlder west side of road in pasture, 55 feet from road center, marked "1262 R."	1,262.021
Hinckley, 3.4 miles northeast of; nail in root of elm tree beside double maple tree on line of wire fence south side of road, about 290 feet west of Oneida-Herkimer County line	1,248.68
Northwood; chiseled square on stone abutment at northwest corner of iron bridge over stream at sawmill	1,207.95
Northwood, 0.6 mile east of; chiseled square on bowlder on south side of road opposite road from the north and in front of an old abandoned schoolhouse	1,228.89
Northwood, 2.2 miles east of; chiseled square on bowlder north side of road 150 feet east of old abandoned house	1,249.22
Northwood, 2.8 miles east of; copper bolt in large bowlder 7 feet north of center of road and 3,450 feet west of abandoned house south of road, marked "1258 R."	1,258.048
Northwood, 3.7 miles east of; chiseled square on large bowlder sticking out of bank left side of road going south and fording West Canada Creek	1,239.68
Northwood, 4.8 miles east of; chiseled square on large flat bowlder 15 feet north of center of road near wire fence	1,264.87
Northwood, 5.2 miles east of; chiseled point, painted black, and marked "H''' " on a large bowlder 125 feet north of road and 100 feet west of small house. This is a State bench mark	1,289.43
Hubbard's Hotel, 0.18 mile east of; State bench mark, on bowlder in meadow about 60 feet south of road and 25 feet east of a fence; chiseled point, painted and marked "E''' "	1,276.65
Ohio, 3.3 miles north of; chiseled circle on large bowlder 5 feet west of center of road	1,307.51
Ohio, 2.4 miles north of; chiseled square on bowlder on west side of road in front of a blue house at bend in road to east	1,326.86
Ohio, 1.7 miles north of; nail in root of large maple tree 75 feet east of road near junction with road northwest and southeast	1,396.23
Ohio, 750 feet west of corner near church, 1,200 feet east of schoolhouse and 80 feet north of road, in field belonging to G. Johnson; copper bolt, marked "1374 R."	1,374.160

	Feet.
Ohio, private burial ground opposite schoolhouse; top of footstone of grave marked "D. B.," near Boyce monument	1,377.61
Ohio, 1.1 miles south of; chiseled square on large round bowlder west of road 225 feet north of bridge across small stream	1,262.19
Ohio, 2.6 miles southwest of; chiseled square on stone foundation at northeast corner of iron bridge over Black Creek	1,236.47
Coldbrook, 3.4 miles north of; and 3.6 miles south of Ohio; copper bolt in bowlder 3 feet outside of wire fence on west side of road, 480 feet south of road from west and 1 mile south of crossing of Black Creek, in Prussia Township; bolt is marked "1265 R."	1,265.023
Coldbrook, 3.1 miles northeast of; chiseled square in small bowlder 2 feet north of fence in field on north side of road about 125 feet west of wood-colored house on the north	1,401.92
Coldbrook, 2.4 miles northeast of; chiseled square on small bowlder in sand about 6 feet west of west branch of road which follows bottom of ravine	1,271.80
Coldbrook, 1.7 miles northeast of; chiseled square on bowlder at southwest corner of red bridge across Coldbrook, near cheese factory	1,057.38
Coldbrook, 1.3 miles northeast of; chiseled circle in bowlder 6 inches above ground in front of yellow house on west side of road	1,004.25
Coldbrook, 0.7 mile northeast of; top of iron ring in stone hitching post, northwest side of road opposite blacksmith shop	928.70

QUEENS COUNTY.

HEMPSTEAD AND OYSTER BAY QUADRANGLES.

The elevations published in the following list are based on the mark "+ 18.0555" made with a chisel on the face of the retaining wall of Long Dock, in the military post grounds at Willets Point. The elevation of this bench mark was accepted as 14.060 feet above mean sea level, as obtained from tidal gage observations made by the United States Coast and Geodetic Survey and the Corps of Engineers, United States Army, at Willets Point.

The leveling was done under the general direction of Mr. E. B. Clark, topographer, by Mr. Clark Brown, levelman.

All bench marks dependent on this datum are marked with the letters "W. P." in addition to figures of elevation.

WILLETTS POINT, VIA BAYSIDE AND QUEENS, TO MINEOLA.

	Feet.
Willetts Point, military post grounds; long dock, face of retaining wall under coal shed, marked "+18.0555" with chisel	14.060
Bayside, northeast corner Bell and Park avenues, 150 feet south of railroad crossing; top of fire hydrant	76.66
Queens, ¼ mile north of, opposite site of new schoolhouse, east of road; 6-inch cherry tree, notch in trunk	82.1
Creedmoor schoolhouse, northwest corner of Madison avenue and Pine street; iron bench-mark post set in ground 15 feet from south line of lot and 2 feet from front line, bronze cap, marked "85 W. P."	85.163
Floral Park, ¼ mile northwest of; chiseled square on bridge seat at west end of overhead railway crossing	96.91
Mineola, 1 mile west of, 100 feet east of crossroads; notch on root of 2-inch cherry tree south of road by fence	97.2

MINEOLA, VIA JERICHO, TO EAST NORWICH.

	Feet.
Mineola, ¼ mile north of; wire nail in stump of telegraph pole at northeast corner of railroad crossing	109.81
Mineola, 2½ miles northeast of and 2 miles east of railroad crossing, on the Queens-Jericho turnpike, 200 feet east of road to south; nail in root of 15-inch maple tree, south side of road	122.58
Jericho, 2 miles west of, ¼ mile east of crossroads, 15 feet north of road; top of bell of iron-pipe culvert	135.02
Jericho, top of marble highway monument in triangle of roads opposite hotel	194.08
Jericho, Jericho turnpike at fork of roads to Oyster Bay and Syosset; retaining wall east of road, 15 feet from driveway to residence; cross mark on bronze tablet marked "218 W. P."	218.160
East Norwich, ¼ mile south of; wire nail in top of stump of locust tree 12 inches in diameter 4 feet from fence corner southeast corner of crossroads	215.60
East Norwich, 300 feet south of church, notch in root of black walnut tree 3 feet in diameter opposite small cemetery	186.4

EAST NORWICH, VIA ROSLYN, TO BAYSIDE.

Brookville, double-pipe culvert at crossroads; top of bell of north pipe at southeast corner of roads	122.75
Glen Head, 1,000 feet east of road to; top of bell south end of iron-pipe drain	140.35
Wheatly Hills railroad station, 1,000 feet south of; 300 feet east of railroad crossing; notch on west side of apple tree by south road fence	204.5
Roslyn, north entrance to new school grounds; center of first step above bottom landing	37.04
Roslyn, west side of south front of upper basin on public fountain; cross mark on bronze tablet, marked "37 W. P."	37.452
Roslyn, southeast corner of Main street and turnpike; south end of lower step, entrance to granite clock tower	40.08
Roslyn, ⅛ mile west of; top of large bowlder 100 feet east of crossroads and 50 feet east of hotel	166.44
Roslyn, 1¼ miles west of; notch on root of double-trunked oak tree 12 inches in diameter at southwest corner of crossroads	175.7
Manhassett, notch on root of maple tree 18 inches in diameter, east side of hill road 100 feet south of fork of road west of pond	51.3
Little Neck, notch on root of cherry tree 2 inches in diameter at northwest corner of roads	93.2

MINEOLA, VIA GARDEN CITY AND HEMPSTEAD, TO MERRICK.

Mineola, north corner west face of pier north of door in foundation west side railroad water tank	105.52
Mineola, crossmark, on bronze tablet, set in coping west end of north pier of railroad water tank; tablet is marked "105 W. P."	105.291
Garden City, first street south of railroad; top of valve stem, fire hydrant, northwest corner of street	87.17
Hempstead, south side of Front street, 25 feet west of Main street; top of fire hydrant	54.06
Merrick, 100 feet north of railroad crossing; point in center of stone monument, 6 inches square, on east line of street	18.73
Merrick, southwest corner of railroad crossing about 15 feet from center of track, 5 feet west of west line of street, 15 feet north of corner of store; iron bench mark post, bronze cap, marked "19 W. P."	18.834

MERRICK, VIA FREEPORT AND ROCKVILLE CENTER, TO MINEOLA.

	Feet.
Freeport, northeast corner Main and Fulton streets; top of fire hydrant..	23.01
Milburne, Brooklyn waterworks reservoir, overflow structure; southeast corner of coping of pier	11.41
Rockville Center, 300 feet south of railroad crossing; southeast corner of Village avenue and Observer street; top of fire hydrant	27.66
Rockville Center, northeast corner of Village avenue and Observer street; cross mark on bronze tablet set in stone water table of brick building, north of door, between pilaster and window, marked "26 W. P."	26.378
Rockville, 1¼ miles north of; large reservoir, corner of stone on tangent, north face coping of north extension of slope wall, east side of reservoir	36.48

MARYLAND, PENNSYLVANIA, AND WEST VIRGINIA.

ALLEGANY AND GARRETT COUNTIES, MARYLAND; SOMERSET AND BEDFORD COUNTIES, PENNSYLVANIA; AND MINERAL AND HAMPSHIRE COUNTIES, WEST VIRGINIA.

FROSTBURG AND FLINTSTONE QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the top of stonework at the northeast corner of Allegany County court-house, Cumberland, Maryland, which is marked "C. 688." The elevation of this bench mark above mean sea level is derived from the bench mark "I" of the United States Coast and Geodetic Survey transcontinental line of precise levels on the coping of the feed lock of the canal. This bench mark is a chiseled square, marked with the legend "I. B.M. U.S.C.S. 1878," and its accepted elevation, in accordance with the latest information available, is 623.602 feet above mean sea level. Based on this, the height of the central datum tablet above described is accepted as 687.628 feet above mean sea level.

The leveling was done by Mr. Hargraves Wood, levelman, under the general direction of Mr. J. H. Wheat, topographer.

All bench marks dependent on this datum are marked with the letter "C," in addition to the figures of elevation.

CUMBERLAND TO FROSTBURG, VIA MOUNT SAVAGE, ALONG CUMBERLAND AND PENNSYLVANIA RAILROAD.

	Feet.
Cumberland, coping of feed lock of canal; United States Coast and Geodetic Survey bench mark "I;" marked "I. B.M. U.S.C.S. 1878."	623.602
Cumberland, Allegany County court-house; bronze tablet, in top of stonework, northeast corner of building, marked "688 C."	687.628
Cumberland, Baltimore street; north rail, Georges Creek Railroad, center of street	626
Cumberland, No. 91 Mechanic street; top of curbstone in front of	622.49
Cumberland Narrows, 200 feet east of signal station and 1,000 feet east of Pennsylvania Railroad bridge; top of C. P. post of Baltimore and Ohio Railroad track	658
Cumberland paper mills, 1,000 feet west of; southeast abutment, Baltimore and Ohio Railroad bridge over Wills Creek	679.38

	Feet.
Kreigbaum, 2,000 feet west of station, 400 feet east of Henry Diffenbaugh's; stone south end east drain on Mount Savage Pike	752.04
Barrelsville and Kreigbaum, 200 feet east of tank between; outcropping ledge of rock, north side of Cumberland and Pennsylvania Railroad	880.39
Barrelsville, 75 feet west of station; railroad spike in telegraph pole	1,011.07
Wilmouth Switch, road crossing east of; ballast wall, northwest abutment bridge	1,064.22
Mount Savage, 1,000 feet east of station; copper bolt, in southwest abutment of highway bridge over Sulphur Creek; marked "1198 C."	1,197.879
Moranton, ¼ mile east of; abutment old bridge over Cumberland and Pennsylvania Railroad	1,370.80
Moranton, station platform	1,453.0
Frostburg, 50 feet east of tunnel on Cumberland and Pennsylvania Railroad; bronze tablet, set in south side of rock cut, marked "1929 C."	1,928.550

FROSTBURG TO CUMBERLAND VIA VALE SUMMIT STATON (POMPEY SMASH), ALONG CUMBERLAND AND PENNSYLVANIA RAILROAD.

Vale Summit station, 250 feet west of and 100 feet south of Georges Creek Railroad; copper bolt in large bowlder, marked "1993 C."	1,993.034
Vale Summit, 1 mile east of; highest point of large rock 40 feet north of railroad, 300 feet east of tank	1,835.04
Georges Creek Railroad, mile post 11; top of	1,776.87
Clarisville, platform at station	1,637.4
Mile post 10, top of	1,620.86
Mile post 9, ¼ mile east of and ¼ mile west of tunnel; highest point of bowlder 30 feet south of railroad	1,419.54
Mile post 8, railroad spike in side of	1,326.95
Mile post 6, railroad spike in side of	1,079.20
Alleghany Grove, Georges Creek and Cumberland Railroad, platform at station	1,049.9
Mile post 4, nail in top of	863.89
Cumberland, 2½ miles west of; platform at Park station (Casino), Georges Creek and Cumberland Railroad	756.7
Mile post 2, nail in top of	657.84

CUMBERLAND TO FLINTSTONE, ALONG OLD NATIONAL PIKE.

Cumberland, Baltimore, and Decatur streets; stone at northwest corner	690.86
Cumberland, 20 feet east of gate of German Lutheran cemetery, stone south side of pike	776.32
Cumberland, 2½ miles east of, on Baltimore pike, 1,200 feet east of Hammersmith's; chisel cut on stone, southeast end of drain	854.60
Cumberland, 2½ miles east of; stump of telegraph pole 60 feet northeast of road from north	770.8
Wolf Mills, northwest abutment of bridge over Everts Creek	670.08
Cumberland, 4 miles east of; nail in telegraph pole south side of pike opposite Wilson's big barn	738.01
Six-Mile House, ¼ mile west of; chisel cut on stone south end of drain 600 feet east of church	859.07
Six-Mile House, foundation, northeast corner; copper bolt, marked "881 C."	881.332
Six-Mile House, 1 mile east of, 70 feet east of road to house north of pike; nail in telegraph pole north side of pike	1,230.76
Six-Mile House, 1½ miles southeast of; 200 feet east of road to south; nail in telegraph pole south side of pike	1,331.23
Flintstone, top of mountain, at beginning of descent toward; chisel cut on ledge of rock	1,720.21

	Feet.
Flintstone, 2 miles east of; nail in telegraph pole southeast corner of pike and Dickerson roads	1,185.73
Flintstone, 1 mile east of; top of pointed north side of pike	922.78
Flintstone, Dr. Robbinson's house, northwest corner of foundation; bronze tablet, marked "828 C."	828.204

FLINTSTONE TO OLDTOWN, ALONG OLDTOWN ROAD.

Marley Branch mill, ¼ mile south of; cut on rock, east side of road, 650 feet east of watering trough	789.89
Flintstone, second crossing of Town Creek south of; blaze on ash tree east side of road	710.1
Flintstone, fourth crossing of Town Creek south of; blaze on ash tree east side of road, 0.04 mile south of crossing	687.6
Flintstone, sixth crossing of Town Creek from; copper bolt in ledge, 2 feet above grade of Creek road to Oldtown, west side of road about 0.06 mile northeast from L. T. Shryock's, marked "666 C."	666.217
Oldtown, 100 feet north of first crossing of Town Creek from; nail in root of small sycamore tree, east side of road	624.2
Oldtown, 3 miles north of, near top of ridge; nail in root of white oak tree, east side of road	833.5
Oldtown, 2 miles north of; cut on large rock east side of road 300 feet south of Hendrix gate	753.51
Oldtown, Lock 70; copper bolt in coping, south wall, 15 feet east of west end, marked "564 C."	563.989

OLDTOWN TO CUMBERLAND, ALONG CHESAPEAKE AND OHIO CANAL.

Chesapeake and Ohio Canal, Lock No. 67; coping stone	539.71
Chesapeake and Ohio Canal, Lock No. 71; coping stone	571.80
Chesapeake and Ohio Canal, Lock No. 72; east end of north coping	581.08
Chesapeake and Ohio Canal, Lock No. 73; coping	590.37
Baltimore and Ohio Railroad bridge across Evitts Creek; top of ballast wall, west abutment	627.06
South Cumberland, Virginia avenue; top of rail, Baltimore and Ohio Railroad crossing	646.84

PATTERSON CREEK TO ALASKA, WEST VIRGINIA.

Patterson Creek, Baltimore and Ohio Railroad station; nail in corner of wooden curb to platform	575.0
Patterson Creek station, 2 miles southwest of; floor at southeast corner of wooden bridge	572.0
Frankfort, 1 mile north of, 200 feet south of creek from west; west end of small wooden drain	597.56
Frankfort (Alaska), ¼ mile northwest of; copper bolt in west end of north abutment highway bridge over Patterson Creek, marked "589 C."	588.628

WEST VIRGINIA.

KANAWHA, PUTNAM, LINCOLN, BOONE, LOGAN, MINGO, WYOMING, MCDOWELL, AND MASON COUNTIES.

CHARLESTON AND OCEANA QUADRANGLES.

The elevations in the following list were published in part in the Appendix to the Eighteenth Annual Report of the Survey, being based on a bench mark determined by trigonometrical leveling by the United

States Coast and Geodetic Survey at St. Albans west base monument. The leveling in connection with this work was done chiefly by Mr. Hargraves Wood, levelman, under the direction of Mr. Hersey Munroe, topographer, during the seasons of 1896 and 1897.

In the spring of 1898 Mr. E. L. McNair, levelman, connected levels brought from Hamden Junction bench mark of the transcontinental line of precise levels of the United States Coast and Geodetic Survey, via Thurman and Gallipolis, Ohio, to Point Pleasant, West Virginia. At this place connection was made with bench mark of the United States engineers on coping of Lock 11, on Great Kanawha River. The result was a difference of 4.780 feet, which is added to the elevations determined by the United States engineers on Great Kanawha River, and a permanent bench mark was left in Point Pleasant bearing the accepted elevation as brought from the Coast Survey. The elevations listed in the appendix of 1897 above referred to, as based on the Coast Survey monument at St. Albans, showed a difference of elevation between it and the United States engineer lock bench marks of 3.544 feet, whereas the difference now accepted is 4.780 feet. As a consequence, the levels hereafter listed differ from those published in the appendix referred to by the amount 0.836 foot, which is added to those elevations, and they are accordingly about 1 foot higher than the elevations as stamped on the bench marks established in 1896 and 1897. Based on these connections, the elevation of the datum tablet placed in the State capitol building in Charleston in 1897, and marked "C. 602," is now accepted as being 601.597 feet above mean sea level. The bench marks dependent upon this datum have been marked with the letter "C" in addition to the figures of elevation.

LOCK NO. 6 TO CHARLESTON.

	Feet.
Lock No. 6, Great Kanawha River; top of coping stone. A correction of 4.780 feet as determined at Lock No. 11 on the Great Kanawha River was added to the elevation of the coping of Lock No. 6 near Charleston. The elevation of coping of Lock No. 6 by the Engineer Corps is 565.5. The corrected elevation is	570.28
Lock No. 6, 0.9 mile east of; ⊞ chisel mark on rock ledge 15 feet north of road and 700 feet west of tannery	622.85
Charleston, 2¾ miles northwest of; ⊞ on sandstone from north wall of stone arch bridge over Two Mile Creek. Bridge is known as Two Mile Bridge	597.03
Charleston, 2.4 miles northwest of; nail in top of oak post 2 feet high, beside sidewalk on south side of road 18 feet west of corner of Tinsley's grocery	619.74
Charleston; 1¼ miles northwest of State Capitol; ⊞ chisel mark on sandstone wall at southeast corner of stone arch bridge. About ¼ mile northwest of suspension bridge across Elk River	594.62

CHARLESTON UP TWOMILE CREEK AND ALONG CHARLESTON AND SISSONVILLE ROAD TO WALLACE'S STORE ON TUPPER CREEK.

Charleston, State Capitol, in southwest corner of; bronze tablet marked "602 C"	601.597

	Feet.
Twomile Bridge, 1 mile north of; ⊞ chisel mark on sandstone abutment at northwest corner of wooden bridge, opposite road going east up branch	587.54
Twomile Bridge, 2 miles north of; ⊞ chisel mark on sandstone bowlder at southwest corner of small wooden bridge near wood-colored house on west of road	604.77
Twomile Bridge, 2¾ miles north of; about 200 feet southwest of Methodist church known as Wesley Chapel; copper bolt in bowlder marked "604 C"	604.751
Wesley Chapel, ¼ mile north of; ⊞ chisel mark on bowlder near middle of road and 10 feet north of elm tree; 400 feet northwest of store	607.35
Wesley Chapel, 1¼ miles north of; ⊞ chisel mark on sandstone bowlder 2¼ feet from walnut tree (near bridge) on east side of road opposite house of G. W. Jenkins	678.90
Wesley Chapel, 2¼ miles north of; ⊞ chisel mark on large sandstone ledge 20 feet east of road and about ¼ mile southeast of divide between waters of Two Mile Creek and Tupper Creek	807.18
Wallace's store, 0.9 mile south of; ⊞ chisel mark on large flat bowlder 8 feet northeast of road near small wooden bridge; a log house 275 feet south	745.87
Wallace's store, 75 feet east of; ⊞ chisel mark on sandstone bowlder on edge of creek 10 feet east of road	678.23
Wallace's store, ¾ mile east of; copper bolt in bowlder on south edge of road and about 600 feet east of James Wallace's house, marked "668 C".	667.677

WALLACE'S STORE ON TUPPER CREEK, VIA MARTINS BRANCH AND POCATALICO RIVER TO POCA.

Martins Branch road, south side of and ¼ mile above mouth; 175 feet west first crossing near schoolhouse; copper bolt in rock ledge 1 foot above grade, marked "C 592"	591.942
Rocky Fork, 300 feet from mouth of; railing post west side bridge (north end) over	594.40
Pocatalico River and Lick Branch, summit between; nail in root walnut tree	832.79
Poca, about 3¼ miles southeast of; stone on bridge over small stream	567.72
Poca, 1¼ miles southeast of; nail in root of large elm north side of road, south bank Pocatalico River	570.95

POCA, ALONG KANAWHA AND MICHIGAN RAILWAY TO ST. ALBANS.

Poca station, 300 feet south of; copper bolt on west side south abutment highway bridge over Correly Branch; marked "C 572"	573.266
Milepost 107, Kanawha and Michigan Railway, nail in top of	589.77
Milepost 108, Kanawha and Michigan Railway, nail in top of	592.56
Milepost 109, Kanawha and Michigan Railway, nail in top of	591.80
Milepost 110, Kanawha and Michigan Railway, nail in top of	592.77
Lock 7, top coping; equals 555.50 United States Engineer elevation	560.280
Lewis railroad station, ¼ mile east of; nail in root of large walnut tree at bend in lane, 600 feet north of Chesapeake and Ohio Railway	597.83
Scott railroad station, 75 feet south of; iron post in Pine's orchard, 50 feet south of Chesapeake and Ohio Railway tracks, marked "693 C"	693.781
St. Albans, west base monument, located in fence line on west side of First street, 60 feet north of the north rail of the Chesapeake and Ohio Railway track; center of monument is marked by limestone post projecting 1 foot above ground, in top of which is a copper bolt, the elevation of which is	595.616

LOCK 6 TO TYLER CREEK SCHOOLHOUSE.

	Feet.
Lock 6, coping; equals 565.50 United States Engineer elevation	570.28
Lock 6, ¼ mile northwest of; bridge over small branch of Tyler Creek	589.34
Tyler Creek road, ¼ mile southeast forks of road near Tyler schoolhouse; copper bolt in rock 20 feet west of drain across, marked "C 623"	624.296

LOCK 6, UP MIDDLE FORK DAVIS CREEK TO MOUTH OF LONG BRANCH.

Davis Creek, southeast abutment Chesapeake and Ohio Railway bridge over (top ballast wall)	604.55
Trace Fork Davis Creek; Kanawha and Coal River Railway trestle over; top of rail	602.06
Milepost 2, top of; Kanawha and Coal River Railway	597.59
Dry Branch, ¼ mile south of; nail in root of beech tree east side of road	597.08
Long Branch, 900 feet north of; between second and third crossings north of schoolhouse; copper bolt in large bowlder west side middle fork Davis Creek, marked "C 659"	660.187

LOCK 5, UP LENS CREEK TO RACINE AND DOWN COAL RIVER TO MOUTH OF LICK CREEK.

Lock 5, coping; equals 572.50 United States Engineer elevation	577.280
Chesapeake and Ohio Railway culvert over Rush Creek; ¼ mile northwest of; copper bolt in middle one of three ledges of rock west of side Right Fork Rush Creek, marked "C 639"	639.868
Trestle on West Virginia Southern Railroad, 900 feet southwest Chesapeake and Ohio Railway; top of rail	592.85
Hernshaw, ¼ mile south of; nail in root sycamore east side of road at schoolhouse	704.00
Hernshaw, about 1 mile south of; copper bolt in 3 by 5 foot ledge rock south side road south bank Lens Creek, near A. Hoffman's house, marked "C 722"	723.110
Sixmile Creek, ¼ mile south of; large sycamore tree west side of road; nail in root of	869.23
Lens Creek and Short Creek, gap between; center road, ground surface	1,238
Lens Creek and Short Creek, $\frac{1}{10}$ miles, south gap between; large flat rock east side of road	1,170.21
Racine, about 1 mile north of; nail in root large sycamore tree in road 400 feet south Widow Snodgrass's house	771.21
Racine, 50 feet north of north side church at; on rock west side road 200 feet north Coal River	665.30
Peytona, east end of walnut tree south side of road, nail in root of; third tree from east line walnuts nearly opposite old coal dump across river.	670.37
Peytona, about 2 miles northwest; copper bolt in ledge rock south side road down Coal River, 100 feet northwest of Laurel Branch; 1 mile below White Oak Branch, marked "C. 665"	666.326
Lick Creek, 200 feet north of mouth of; copper bolt in rock west side Coal River road, marked "C. 648"	649.300

RACINE, VIA COMFORT AND HOPKINS, TO MOUTH ROBINSON CREEK.

Torey Branch Coal River, at crossing; nail in root sycamore tree southeast side of road	672.67
Comfort, ⅛ mile north of; copper bolt bottom rock cliff ¼ mile south mouth Joes Creek; east side Coal River road, 4 feet above grade, marked "C. 673"	674.413
Laurel Creek crossing, 600 feet below Sand Fork; large leaning poplar tree east side of road, nail in root of	705.58

	Feet.
Hopkins Fork, 200 feet southeast mouth of; bronze tablet in face rock cliff, marked "C. 734"	735.313
Cristley Branch; nail in root of beech tree north side Laurel Fork 400 feet southwest schoolhouse at	824.18
Prairie Branch, 300 feet southwest of; nail in root of sycamore tree southeast side of road	888.84
Laurel Fork and Robinson Creek, gap between; nail in root large chestnut tree	1,658.25
Robinson Creek, confluence with Right Fork; nail in root of beech tree growing with sycamore tree	876.62
Robinson Creek and Pond Creek, 500 feet from confluence of; copper bolt sunk in protruding bowlder in Ballard Brown's field on east side of and 300 feet from road, marked "C. 746"	747.772

ST. ALBANS, VIA TACKETT CREEK, YOUNG'S STORE, AND TORNADO, TO STARTING POINT.

St. Albans, west base monument, located in fence line on west side of First street 60 feet north of the north rail of the Chesapeake and Ohio Railway track; center of monument is marked by limestone post projecting 1 foot above ground, in the top of which is a copper bolt, the elevation of which is	595.616
Lewis railroad station, ¼ mile east of; nail in root of large walnut tree at bend in lane 600 feet north of Chesapeake and Ohio Railway	597.83
St. Albans, 1¼ miles northwest of; northeast corner of abutment of bridge at first crossing of Tackett Creek	588.91
Tackett Creek, last crossing of; 400 feet west of frame house with well in front; bench mark cut in stone on right side of road	778.91
Tackett Creek, road up; rock on right side just above small spring on left side of road 500 feet east of summit; "B. M." cut on rock	904.05
Tackett Creek, summit where road leaves and follows Hurricane, 1,000 feet west of; nail in poplar stump at end of small bridge on left side of road.	916.72
Hurricane road, right side of; 75 feet beyond new frame house about ¼ mile west of summit on ledge rock	843.30
Young's store, first house south of, on south side of road, belonging to John Hodges; copper bolt set in east chimney 6 feet from ground, marked "U.S.G.S. 737 Ft. B.M."	738.219
Young's store, west side of road leaving Hurricane road at; nail in root of gum tree 6 inches in diameter ¼ mile south from forks where clearing begins on right	813.42
Young's store, road from, to Bridge Creek; large white oak tree on east side 200 feet west of head of hollow on south and backbone of ridge	931.04
Bridge Creek, west bank of; south of and near house on east about ¼ mile south of schoolhouse; nail in small dogwood stump	749.45
Flint Hollow, ¼ mile southwest of mouth of; large rock on bank west side of road and Bridge Creek; cleared field on east, woods on west	700.85
Trace Fork of Mud River, 200 feet below mouth of Twomile Branch, 400 feet northwest of Anderson McAllister's house; copper bolt in huge rock on north side of stream, marked "U.S.G.S. 669 Ft. B.M."	670.050
Twomile Branch (a tributary of Trace Fork of Mud River); large elm tree at mouth of	662.91
Fall Creek, road from; stone on north side 100 feet from top of first ridge near small walnut	1,034.83
Twomile Branch and Right Fork of Fall Creek; nail in root of large chestnut tree on south side of road near first break in ascent of ridge between streams	880.49

	Feet.
Tornado, 2 miles southwest of, on Fall Creek road; nail in root of beech tree on bank near new house	621.05
Tornado, 1½ miles southwest of, on road up Fall Creek; iron post on south side of road 150 feet above first crossing of Fall Creek, marked "614"	614.633
Tornado, mill at; large stone in retaining wall of mill at point where wall meets fence	608.13

GARRETT'S BEND TO SAND GAP, SUGAR CAMP KNOB, DOWN LAUREL FORK OF HORSE CREEK TO MADISON.

Garrett's Bend, 1 mile southeast of, up Trace Fork; nail in root of sycamore tree, east side of road, near foot-log and sawmill	671.34
Garrett's Bend, south end of first foot log at, going up Trace Fork; nail in stump	682.23
Garrett's Bend, 2 miles above; nail in root of walnut tree at barn and crossing of William's Branch	704.09
Sand Gap; nail in large stump under chestnut tree west side of road	1,089.09
Sand Gap, 500 feet west of fork of roads at; copper bolt in huge rock above John A. Midkiff's house, marked "U.S.G.S. 1079 B.M."	1,079.470
Brushy Knob, east end of, on road to Little Coal River; nail in root of white-oak tree on west side of road	1,223.82
Sugar Camp Knob signal, ¼ mile south of cabin near, 125 feet below fork of road; nail in root of hickory tree on west side of road	1,198.35
Sugar Camp Knob signal, 1¾ miles from, on Laurel Fork; nail in root of beech tree at schoolhouse on west side of road	839.80
Laurel Fork, 1½ miles above mouth of; nail in root of beech tree on east side of road	754.63
Laurel Fork, ¼ mile above mouth of; nail in root of beech tree on west side of road	706.97
Laurel Fork, 200 feet above confluence with Horse Creek; copper bolt in rock ledge on east bank, opposite James McClure's house near last crossing of Laurel, marked "U.S.G.S. 673 Ft. B.M."	673.547
Hill, 1½ miles above; nail in root of leaning beech tree on north bank of Horse Creek about 1,200 feet below Price's house, just below small stream coming in on right	652.92
Trace Branch, 1 mile above mouth; copper bolt in large bowlder on left side of right-hand hollow on Trace Branch of Horse Creek, marked "U.S.G.S. 766 Ft. B.M."	766.856
Hill; top of foundation wall north side of store	669.51
Hill, 1½ miles south of; nail in root of large white oak tree on west side of road ¼ mile south of ford	658.54
Camp Creek, ¼ mile north of; nail in root of large sugar-maple tree on west side of road 300 feet above Stolling's house	663.45
Camp Creek, ¼ mile north of; copper bolt in small ledge of rock on east side of road going up Little Coal River 300 feet above B. Stolling's, marked "U.S.G.S. 660 Ft. B.M."	661.095
Camp Creek, ¾ mile south of, opposite Dr. Hill's house; nail in root of large beech tree west side of road	670.69
Camp Creek, 2 miles south of; nail in root of beech tree west side of road.	711.64
Lick Creek, 1 mile north of, 600 feet above house where road forks to left; nail in root of hollow beech tree on bank of river west side of road	671.95
Lick Creek, opposite mouth of; nail in root of one of two sycamore trees overhanging river	668.20
Lick Creek, 1½ miles south of mouth of; nail in root of leaning beech tree on south side of Lick Creek, below small stream coming in on south	717.80
Lick Creek, 500 feet below sawmill on; nail in root of leaning beech tree on north side of road	744.09

	Feet.
Lick Creek, 3 miles above mouth, at Chambers's house; nail in root of walnut tree in field on north side of road	768.33
Lick Creek, 3½ miles above mouth of and ¼ mile above Chamber's house, on Right Fork of Lick Creek; copper bolt in bowlder above coal bank 25 feet east of creek between two walnut trees, one of which is blazed; bolt is marked "U.S.G.S. 820 Ft. B.M."	820.328
Newport (Danville post-office), ¼ mile above; nail in root of large elm tree on south side of road	679

MADISON, UP SPRUCE FORK TO SENG POST-OFFICE.

Madison, sheriff's office; bronze tablet in front wall, marked "704"	704.146
Spruce Fork, 600 feet above mouth of; nail in root of beech tree on east side of road	699.69
Madison, 1½ miles south of; nail in root of white-pine tree on east side of road up Spruce Fork 225 feet above schoolhouse	709.72
Low Gap Branch, 450 feet above mouth; ledge of rock on north side of road.	719.67
Spruce Fork, ¼ mile below Hunters Branch; nail in root of large, leaning sycamore tree on west side of road, bank of Spruce Fork, 5 feet above water	728.21
Spruce Fork, ¼ mile above Hunters Branch; nail in root of apple tree 600 feet above log house on east side of road	746.29
Spruce Fork, 4 miles below Hewett Creek; nail in root of large sycamore tree 200 feet above schoolhouse	744.76
Spruce Fork, 1 mile below mouth of Hewett Creek; nail in root of elm tree on east side of road	765.12
Spruce Fork, 200 f et below mouth of Hewett Creek; nail in root of sycamore tree on east side of road in front of schoolhouse	770.15
Spruce Fork, mouth of Dry Branch, near John French Stollings; nail in root of oak tree on west side of road	785.90
Spruce Fork, ¼ mile below mouth of Rockhouse Creek; nail in root of water-birch tree on south side of road 200 feet above crossing	816.58
Spruce Fork, ¼ mile above Rockhouse Creek; nail in root of sycamore tree on east side of road 400 feet above cabin on right	828.67
Spruce Fork, ¼ mile above mouth of Beech Creek on north side of Spruce Fork, 300 feet below splash dam opposite William Coleman's barn; copper bolt in ledge of rock, marked "U.S.G.S. 846 Ft. B.M."	846.234

FROM MOUTH OF HEWETT CREEK TO PECK AND UP GUYANDOT RIVER TO LOGAN.

Hewett Creek, 300 feet above mouth of; copper bolt in ledge of rock opposite schoolhouse and on south side of creek; marked "U.S.G.S. 767 Ft. B.M."	767.954
Hewett Creek, 1 mile above mouth of; on south side of road 300 feet below French McNealy's; nail in root of leaning beech tree	792.34
Hewett, 1 mile above post-office; nail in root of elm tree on east side of road 1,000 feet below splash dam	828.71
Hewett, 2 miles above post-office; 600 feet below Robert Hardessy's; nail in root of small leaning birch tree on south side of road	856.15
Hewett Forks, 1½ miles below; nail in root of leaning beech tree on west side of road in front of schoolhouse	905.23
Hewett Forks, ¼ mile above; rock in road near ledge on right with coal under it	1,004.57
Hewett and Big creeks, top of ridge between; nail in root of mulberry tree 600 feet below top of ridge on Big Creek side	1,167.10
Big Creek, head of; nail in root of chestnut tree on east side of road above Sanders's barnyard	983.24

	Feet.
Mill Creek head of; nail in root of walnut tree on north side of road above bend at house near foot of mountain	974.20
Peck, ¼ mile south of post-office; on the northwest side of Mill Creek 300 feet above mouth; copper bolt in northwest corner of huge bowlder, marked "U.S.G.S. 653 Ft. B.M."	653.549
Peck, 1 mile above on Guyandot River; nail in root of beech tree on west side of road	699.47
White's Mill, ¼ mile south of; nail in root of large elm tree on west side of road along Guyandot River, 200 feet below schoolhouse	646.12
Logan, 1¼ miles south of; nail in root of huge sycamore tree on west side of road	652.96
Logan, 2 miles south of; 500 feet above Hamilton McDonald's; nail in root of beech tree on right of road	655.34
Logan, bronze tablet set in wall at northeast corner of court-house, marked "678"	678.822

LOGAN TO MOUTH OF BIG HUFF CREEK AND UP GUYANDOT RIVER TO GILBERT.

Logan, 1 mile east of, on road up Guyandot River; large bowlder marked "B.M.", on south side of road	668.97
Dingess Run, 200 feet south of; nail in root of large sycamore tree west of road	663.62
Andrew Perry's house, ¼ mile above, on west side of road; nail in root of leaning water birch	675.34
Ely Gore's, across river from, and 500 feet above hollow on left; nail in root of leaning sycamore on west side of road	686.46
Rum Creek schoolhouse, ¼ mile above; rock at root of large cucumber tree on west side of road	688.76
Floyd Buchanan's, top of hill across river from; lower projection on vertical ledge of rock on east side of road	773.79
Hugh Avis's, ¼ mile above; nail in root of beech tree on west side of road	713.83
Rich Creek, opposite mouth of; copper bolt in rock 20 feet north of Methodist Episcopal Church, marked "U.S.G.S. 725 Ft. B.M."	725.559
Rich Creek, 1 mile above; rock on right of road, near Melros White's	723.01
Henry Branch, ¼ mile above; nail in root of walnut tree on east side of road	756.83
George McDonald's field, cedar tree in, 1,500 feet below his house on the south side of Guyandot River (B. M. 724.465 of N. & W. R. R.); nail in root	730.97
Buffalo Creek, opposite mouth of; nail in root of sycamore tree on south side of Guyandot River, near water's edge	723.09
Buffalo Creek, ¼ mile above mouth of, opposite Martin Doss's and 60 feet above foot log, on west side of Buffalo; copper bolt in rock, marked "U.S.G.S. 728 Ft. B.M."	728.511
Buffalo Creek, 2 miles above mouth of; nail in root of sycamore tree on east side of road	785.02
Buffalo Creek, west side of valley, 3 miles above mouth of; copper bolt, marked "U.S.G.S. 808 Ft. B.M."	808.539
Rockhouse Creek, west side of and 1 mile above mouth; copper bolt in rock near south end of cliff; marked "U.S.G.S. 792 Ft. B.M."	792.749
Big Huff Creek, east side of, and 300 feet above mouth; copper bolt in rock, marked "U.S.G.S. 727 Ft. B.M."	727.962
Guyandot River, ¼ mile above mouth of Rockhouse Creek; nail in root of small black oak on west side of road	737.70
Guyandot River, 200 feet above Wayne McDonald's store; nail in root of small sycamore tree, west side of road	760.15

	Feet.
Henderson Browning's, ¼ mile below; nail in root of large white oak on south side of road	752.16
Elk Creek, 600 feet below; nail in root of beech tree on west side of road, 300 feet below Emory Altizer's	754.35
Spice Creek, ¼ mile above; nail in root of white-walnut tree on north side of road, 1 mile below Jim Justice's	771.03
Guayandot River; large rock on bank of, west side, where road comes near water, ¼ mile above Jim Justice's	756.59
Gilbert, 1 mile below; nail in root of sycamore tree with spreading roots 200 feet above old mill race where wagon road crosses river	804.39
Gilbert, ¼ mile below; rock on west side of road 200 feet above high cliff on left	822.43

GILBERT, VIA WHARNCLIFFE, TO STATE CORNER BETWEEN VIRGINIA, WEST VIRGINIA, AND KENTUCKY.

Gilbert, opposite Alexander Stafford's store; iron post in field, marked "832"	832.571
Gilbert, rock on east side of road near top of hill above Stafford's store	855.75
Gilbert Creek, 1 mile above mouth of; rock marked "B.M." in creek and road at first crossing above Zat Ellis's house	848.05
Gilbert Creek, ¼ mile above Horsepen Creek; nail in root of beech tree on east side of road 600 feet below Scott Ellis's	891.48
Twisted Gun Gap Branch, 800 feet below; nail in root of poplar tree on east side of road up Gilbert Creek	945.39
Twisted Gun Gap, summit of; nail in root of oak tree on east side of road	1,443.49
Ben Creek, head of right fork below deserted cabin; rock on east side of road near rock cut at foot of mountain	1,200.50
Ben Creek, 400 feet below Laurel Branch; nail in root of small white pine on east side of road	1,017.36
Ben Creek, 300 feet below Laurel Branch, 4 miles above Wharncliffe; iron post on east side of road, opposite T. E. Brown's house, marked "1020"	1,020.74
Ben Creek, 400 feet below Pound Mill Branch; nail in root of small sycamore tree on east side of road	949.09
Ben Creek, 200 feet above Spring Fork Branch; at Michael Hatfield's; nail in root of black-oak tree in west side of road	890.24
Wharncliffe, railroad bridge over Ben Creek; bridge seat of east abutment (B. M. 820.39 of N. & W. R. R.)	822.90
Kentucky, Virginia, and West Virginia, corner of State lines, ¼ mile south of Wharncliffe; iron post, marked "825"	826.087

KENTUCKY, VIRGINIA, AND WEST VIRGINIA CORNER, VIA MOUTH OF LONG POLE, UP SAME, TO NEAR OAK BRANCH.

Long Pole Creek, 1¼ miles above mouth of; nail in root of beech tree on north side of road	976.20
Long Pole Creek, 1,200 feet below Oak Branch; iron post on south side of road, marked "1050"	1,051.209

UP BIG HUFF CREEK, VIA CYCLONE, TO ITS HEAD AND TO ECHART.

Millard McDonald's, 600 feet below; nail in root of poplar tree on south side of road	771.20
Big Spring Branch, 1,800 feet above crossing of; nail in root of sycamore tree on north side of road	793.55
Cyclone, copper bolt in rock opposite Henchman's house, marked "U.S.G.S. 854 Ft. B.M."	854.917

	Feet.
Ed. Cook's, ¼ mile above; nail in root of beech tree on south side of road.	897.19
Lem Brown's, ¼ mile above; nail in root of beech tree on south side of road.	949.51
Lem Brown's, nail in root of poplar tree on south side of road at.....	993.94
Toney Fork of Huff Creek, south side of, about 2 miles above mouth; copper bolt in ledge of rock, marked "U.S.G.S. 1234 Ft. B.M."	1,235.414
Road Gap Branch, 600 feet below; iron post on east side of road up Big Huff Creek, 100 feet above D. H. Cook's store, marked "1068"	1,068.525
Rockhouse Branch, 600 feet above at Gordon Burgess's; nail in root of sycamore tree on east side of road up Big Huff Creek.....	1,149.91
Road fork, 1 mile above; nail in root of tall sycamore tree 50 feet to right of road up Big Huff Creek.....	1,220.57
Road fork, 2 miles above; nail in root of water birch on north side of road up Big Huff Creek.....	1,274.63
Trace fork, 600 feet above; nail in root of tall sycamore tree on west side of road up Big Huff Creek.....	1,375.41
Brushy Fork, 100 feet above mouth of, opposite W. R. Blankenship's; nail in root of sycamore tree east side of Big Huff Creek.....	1,483.59
Laurel Branch, ¼ mile above and a little below Garden Branch, on east side of Big Huff, about 600 feet below Bailey's; nail in root of sycamore tree, east side of road	1,606.44
Spring Branch, 1,000 feet above mouth; nail in root of beech tree with top off, on west side.....	1,816.01
Spring Branch; nail in root of sugar maple, half way up mountain, above head of stream, toward lowest part of ridge.....	2,347.72
Spring Branch and Alum Dirt Branch, top of ridge between; nail in root of large water oak, 200 yards east of Joe Lusk's deserted house.....	2,772.52
Alum Dirt Branch, one-third way down mountain toward; nail in root of buckeye tree.....	2,430.02
Echart, east bank of Pond Fork of Coal River, opposite mouth of Skin Fork; copper bolt in ledge of rock, marked "U.S.G.S. 1423 Ft. B.M."...	1,423.95

ECHART, DOWN POND FORK OF LITTLE COAL RIVER, VIA BALD KNOB AND CROOK, TO MOUTH OF WEST FORK, AND UP SAME TO MOUTH OF BROWNS BRANCH.

Pond Fork, 1 mile below Skin Fork; nail in root of sycamore tree on east side of road.....	1.353.88
Skin Fork, 3 miles below; nail in root of leaning sycamore tree on east side of road down Pond Fork.....	1,241.92
Rock Lick Branch, ¼ mile below mouth of; nail in root of sycamore tree on east side of road down Pond Fork.....	1,143.26
Bald Knob, east side of valley at; copper bolt in bowlder opposite Eddy Workman's, marked "U.S.G.S. 1101 Ft. B.M."	1,101.98
Hatfield's store, 1 mile above; nail in root of sycamore tree on west side of road, 100 feet above branch.....	1,031.94
Cow Creek, north side of, ¼ mile from mouth and 800 feet from Jim Gunnoe's; copper bolt in ledge of rock marked "U.S.G.S. 1039 Ft. B.M.".	1,040.02
Hatfield's store, 2 miles below, on west side of Pond Fork and 800 feet above Dick Gerald's; nail in root of leaning sycamore tree east side of road.....	935.60
White's store, ¼ mile above; nail in root of elm tree, with sycamore growing out of it, on east side of Pond Fork	894.39
Crook, first crossing of Pond Fork above; nail in root of sycamore tree on west side of road	849.17
West Fork of Pond, 1,000 feet above junction of Pond Fork; copper bolt in rock, northeast side, marked "U.S.G S. 808 Ft. B.M.".....	809.939

	Feet.
West Fork of Pond, ¼ mile below Brown's Branch; nail in root of sycamore tree on west side of road, 600 feet below John Giles's	864.29
West Fork of Pond, 800 feet below Brown's Branch; copper bolt in ledge of rock on west side of road a little above and nearly opposite small water mill; bolt is marked "U.S.G.S. 884 Ft. B.M."	885.25

JUNCTION OF WEST AND POND FORKS OF LITTLE COAL RIVER TO MADISON.

Bull Creek, 300 feet above mouth; nail in root of leaning water birch on west side of road down Pond Fork	774.76
Robinson Creek, ¼ mile above, and 150 feet above Gusser Gore; nail in root of pine tree right side of road down Pond Fork	761.83
Robinson Creek and Pond Fork, 500 feet from confluence of; copper bolt sunk in protruding bowlder in Ballard Brown's field on east side of and 300 feet from road, marked "U.S.G.S. 746 Ft. B.M."	747.772
Robinson Creek, 1 mile below; nail in root of sycamore tree on north bank of Pond Fork and on south side of road just above schoolhouse	723.19
David Green Branch, 700 feet below on west side of road; nail in root of beech tree with top off, and on east bank of Pond Fork	721.57
Workman Branch, 200 feet above; nail in root of chestnut-oak tree on west side of road down Pond Fork	702.31

OHIO.

JACKSON, SCIOTO, LAWRENCE, AND GALLIA COUNTIES.

HAMDEN, OAKHILL, SCIOTO, GREENUP, IRONTON, GALLIPOLIS, AND POINT PLEASANT QUADRANGLES.

The elevations in the following list are based on a bench mark of the transcontinental line of precise levels of the United States Coast and Geodetic Survey at Hamden Junction, Ohio, the elevation of which has been accepted as 706.665 feet above mean sea level.

The larger portion of the leveling listed below was executed in 1897, and was based on a temporary elevation derived from the Norfolk and Western Railway in Ironton, Ohio. For reduction to mean sea level connection was made with the Hamden bench mark in 1898. Those bench marks which were set in 1897 were marked with the letter "I," referring to Ironton as datum. Those set in 1898 were marked with the letter "A," referring to Athens, of the transcontinental line, as the permanent datum. The difference between these is 3.430 feet, which has been added to the elevations derived from Ironton. As a consequence, the marking of bench marks set in 1897 and stamped "I" is approximately 3 feet lower than the present published and accepted heights of the same.

All of the above spirit leveling was done under the direction of Mr. Hersey Munroe, topographer, by Mr. E. L. McNair, levelman.

HAMDEN JUNCTION, VIA WELLSTON, TO BERLIN, ALONG BALTIMORE AND OHIO SOUTHWESTERN RAILWAY.

	Feet.
Hamden station, ¼ mile east of; cut on the coping of a small drain or culvert, Marietta and Cincinnati Railroad, being bench mark LIII of United States Coast and Geodetic Survey's transcontinental line of precise levels.	706.665

	Feet.
Hamden station, opposite center of; top of north rail of main track of railway	715.50
Hamden, 1.3 miles southwest of; + chisel mark on top of guard-rail bolt at northeast corner of open culvert No. 292, 325 feet north of railroad crossing	691.47
Hamden, 1.3 miles southwest of; road crossing, top of rail at	689.73
Wellston, ¼ mile north of; ⊞ chisel mark on stone foundation at southeast corner of iron highway bridge 25 feet north of railroad	684.21
Ohio Southern and Baltimore and Ohio Southwestern Railway, intersection of; top of rail	688.21
Wellston, intersection of Broadway and railroad	723
Wellston, southeast corner of International Hotel; + chisel mark on pavement stone	725.20
Wellston, First National Bank building, on southwest corner of Broadway and Ohio avenue, in foundation stone in left corner of entrance to; bronze tablet, marked "731 A"	730.853
Wellston, 1.3 miles south of; + chisel mark on head of track spike on east end of sill of bent No. 3 from south end of 11 bent trestle bridge (not numbered)	678.20
Wellston, road crossing, top of rail at	723.7
Berlin, 0.65 mile north of; + chisel mark on guard-rail bolt at northeast corner of bridge No. 297	722.63
Berlin, top of rail at crossing of Cincinnati, Hamilton and Dayton Railway and Baltimore and Ohio Southwestern Railway	714
Berlin station, 20 feet southwest of Cincinnati, Hamilton and Dayton Railway and 60 feet east of Baltimore and Ohio Southwestern Railway; spike in large oak post 1 foot high	710.46

BERLIN TO BURRIS, ALONG CINCINNATI, HAMILTON AND DAYTON RAILWAY.

Berlin, 0.6 mile south of; top of rail at road crossing	718.6
Berlin, 1.2 miles south of; top of rail at road crossing	711.4
Berlin, 1¼ miles south of; + chisel mark on head of driftbolt through cap at southwest corner of bridge No. 189	698.07
Berlin, 2 miles south of; top of rail at road crossing	702.4
Berlin, 2½ miles south of; top of rail at road crossing	702.9
Burris, 1.2 miles north of; + chisel mark on head of driftbolt through cap at southwest corner of bridge No. 193	679.63
Burris, 0.6 mile north of; + chisel mark on head of driftbolt through cap at northwest corner of bridge No. 196	667.76
Burris station, ¼ mile north of; top of rail at road crossing	665.9
Burris station, 1,250 feet north of; + chisel mark on head of driftbolt in east end of cap 2 from north end of bridge No. 197	663.73
Burris station, about 2,000 feet west of, 10 feet north of east and west highway, in sandstone ledge; bronze tablet, marked "702 A"	702.350

BURRIS, VIA ROCKY HILL, TO MADISON FURNACE, ALONG CINCINNATI, HAMILTON AND DAYTON RAILWAY.

Burris station, top of rail at	663.3
Burris, 0.4 mile south of; top of rail at road crossing	664.4
Burris, 0.8 mile south of; top of rail at road crossing, along highway to cut-off bend in railway	672.8
Rocky Hill, 0.7 mile north of; spike in top of fence post at corner of fence on south side of highway and 15 feet north of railroad, 400 feet east of Mr. Plummer's house	690.35
Rocky Hill, ¼ mile north of; top of rail at road crossing	699.5
Rocky Hill; top of rail at road crossing	715.6

	Feet.
Rocky Hill, 400 feet south of; + chisel mark on spike in west end of middle sill under small building on east side of side track	712.16
Rocky Hill, 0.4 mile south of; top of rail at road crossing	699.9
Rocky Hill, 0.9 mile south of; + chisel mark on head of driftbolt through cap at southwest corner of bridge No. 206	696.05
Madison, 1¼ miles south of; + chisel mark on head of driftbolt through cap at northeast corner of bridge No. 212	688.49
Madison station, 575 feet north of, in rock cut on curve about 8 feet west of center of Cincinnati, Hamilton and Dayton Railway, near south end of cut; bronze tablet, marked "688 A"	687.522

MADISON FURNACE TO GALLIA, ALONG CINCINNATI, HAMILTON AND DAYTON RAILWAY.

Madison station, top of rail at	683.9
Madison, ¾ mile south of; + chisel mark on head of driftbolt through cap at southwest corner of bridge No. 219	679.45
Madison; top of rail at road crossing	692.4
Madison, 1¼ miles south of; + chisel mark on head of driftbolt through cap at southwest corner of bridge No. 221	673.70
Madison, 1¾ miles south of; spike in northeast corner of highway bridge 20 feet west of railway	675.18
Madison Furnace, ¾ mile south of; + chisel mark on head of driftbolt through cap at southwest corner of bridge No. 219	679.45
Madison Furnace, 1¼ miles south of; + chisel mark on head of driftbolt through cap at southwest corner of bridge No. 221	673.70
Madison Furnace, 1¾ miles south of, and 175 feet west of Cincinnati, Hamilton and Dayton Railway. 1,500 feet south of large brick house on hill; on spike in bridge plank at northeast corner of small truss highway bridge, painted "U.S.G.S. B.M. 671"	675.18
Cincinnati, Hamilton and Dayton Railway, small wooden railway bridge No. 223; + chisel mark on top of guard-rail bolt at southeast corner of bridge, painted "U.S.G.S. B.M. 683"	686.96
Oak Hill, about 1 or 1¼ miles east of the Baltimore and Ohio Southwestern Railway, Madison Township; on top of iron bench-mark post buried in the ground with top 4 inches above ground, 25 feet west of Cincinnati, Hamilton and Dayton Railway, and 15 feet north of highway at Oak Hill crossing, marked "695 I"	699.052
Kitchen station, second crossing north of; + chisel mark on head of track spike driven in east end of wooden sluice box (8 by 12 inches) under track, 7½ feet east of track and on south side of highway crossing	699.68
Kitchen station, ¼ mile north of; + chisel mark on head of driftbolt in east end of cap of bent No. 2 from south end of bridge No. 229 on Cincinnati, Hamilton and Dayton Railway	670.60
Bridge No. 222 on Cincinnati, Hamilton and Dayton Railway; + chisel mark on head of driftbolt through cap at southwest corner of, 15 feet south of highway crossing and 250 feet south of spur siding on east side of track	658.73
Kitchen, 1¾ miles south of; + chisel mark on head of iron bolt at southwest corner of iron railroad bridge, No. 236	658.44
Gallia, 0.83 mile north of; + chisel mark on head of iron driftbolt at northwest corner of iron railway bridge, No. 240	656.15

GALLIA, VIA HOADLEY AND OLIVE FURNACE, TO HALES CREEK.

Gallia, store and post-office; on cross mark of bronze tablet set in sandstone water table in front of brick building (40 by 60 feet), between doors leading into post-office and railway and telegraph office, which is in northwest corner of building; bench mark is in north side of building, 19 feet from northwest corner, stamped "657 I"	660.477

	Feet.
Gallia, 1¼ miles south of; on spike driven in sill of cattle guard on Cincinnati, Hamilton and Dayton Railway, at southeast corner, 20 feet south of highway crossing, painted, in white, "U.S.G.S. B.M. 671"	675.13
Peniel post-office, ¼ mile north of; + chisel mark on head of driftbolt at southeast corner of railway bridge No. 248, painted, in white, "U.S.G.S. B.M. 684"	688.07
Bridge No. 254, on Cincinnati, Hamilton and Dayton Railway; + chisel mark on head of guard-rail bolt at northwest corner of, painted, in white, "U.S.G.S. B.M. 705"	709.03
Tunnel No. 1, about 1¼ miles northeast of; ⊡ chisel mark on sandstone ledge 12 feet south of center of railway bridge No. 256, 100 feet east of highway crossing, painted, in white, "U.S.G.S. B.M. 732"	735.21
Greenfield Township, sandstone ledge in field on land belonging to Lloyd heirs, in section 31, about 1,200 feet northerly from house of Mrs. E. T. Jenkins; copper bolt, marked "884 I"	887.674
Olive Furnace, 0.93 mile north of; ⊡ chisel mark on sandstone foundation of small wooden highway bridge at northwest corner of	710.61
Olive Furnace, 2.4 miles north of; on spike driven in small oak stump beside rail fence on right of road, about 60 feet south of gate entrance on lands of Louisa Cheeseman	902.27
Hales Creek, 2.7 miles east of; ⊡ chisel mark on sandstone ledge, 5 feet right of road	674.80
Bradys Run, 1.5 miles east of Hales Creek; ⊡ chisel mark on sandstone foundation at southeast corner of small wooden highway bridge over (road crosses valley at this place)	660.28
Hales Creek post-office; ⊡ chisel mark on sandstone top of protection wall to creek, about 3 feet from southwest corner of small wooden truss highway bridge over Hales Creek, painted, in white, "U.S.G.S. B.M. 643"	646.71

HALES CREEK, VIA MONROE FURNACE (ESTHER POST-OFFICE), TO MABEE.

Baltimore and Ohio Southwestern Railway, 1.2 miles north of Hales Creek; 25 feet north of highway crossing and 35 feet south of head block at switch; + chisel mark on head of railroad spike driven near end of cap at southwest corner of culvert, under, painted white "U.S.G.S. B.M. 652"	655.15
Eifort post-office, about 0.18 mile north of; + chisel mark on head of guard-rail bolt at southwest corner of railway bridge No. 355, painted in white "U.S.G.S. B.M. 668"	671.04
Culvert (old), southeast corner of; + chisel mark on head of iron drift bolt in sill at southeast corner of; 0.93 mile from last bench mark, painted in white "U.S.G.S. B.M. 674"	677.26
Monroe station, about ¼ mile south of; 15 feet south of a private highway crossing; + chisel mark on head of iron drift bolt at northeast corner of cattle guard, painted in white "U.S.G.S. B.M. 685"	688.40
Monroe Furnace (Esther post-office); ⊡ chisel mark on sandstone in small wall in front of brick house and store on south side of road, painted in white "B.M. 770"	773.08
Coal road, about 600 feet below water tank on; ⊡ chisel mark on sandstone ledge 15 feet right of road and 35 feet right of railway on tramway, painted in white "U.S.G.S. B.M. 770"	773.83
Esther post-office, about 1.4 miles northeast of and 1.9 miles northeast of Monroe station on Baltimore and Ohio Southwestern Railway, in the northern half of northeast quarter of section 29, Jefferson Township; on cross mark of bronze tablet set horizontally in face of sandstone ledge 140 feet east of or right of highway, about ¼ mile north of water tank on coal railway, stamped "803 I"	805.974

	Feet.
Arthur schoolhouse; on spike driven in root of stump cut off close to the ground 13 feet from southwest corner of schoolhouse, painted white on coal shed, "U.S.G.S. 912" feet above sea	915.54
Forks of road, about 1,000 feet northwest of; on top of wire staple driven in top of large oak stump 8 feet left of road, painted white "U.S.G.S. B.M. 724"	727.55
Mabee post-office, about 0.6 mile in straight line southeast of; ⊞ chisel mark on large sandstone bowlder in bed of creek just above small wooden bridge; about 700 feet to 800 feet south of new iron bridge, painted white "U.S.G.S. B.M. 642"	645.83
Mabee's Corners; ⊞ chisel mark on sandstone bowlder supporting west end of watering trough at northwest corner of intersection of roads, painted white "U.S.G.S. B.M. 644"	647.47

MABEE TO BRUSHY FORK OF LITTLE SCIOTO RIVER.

House on opposite side of road belonging to Warren Gillen; ⊞ chisel mark on sandstone bowlder 2 feet west of gatepost at west end of gate entering barnyard on south side of road, painted white "U.S.G.S. B.M. 628".	631.47
Little Scioto River; ⊞ chisel mark on sandstone foundation at southeast corner of covered bridge on east branch of, painted white, "B.M. 603"	606.02
House (large white) of Sol. Dever; ⊞ chisel mark on slate ledge 7 feet left of road and about 450 feet southeasterly from, painted white "U.S.G.S. B.M. 631"	634.26
Brusky Fork, where comes against hill; ⊞ chisel mark on sandstone ledge 6 feet right of road near point of hill; about 1,000 feet northwest of covered bridge, painted white "U.S.G.S. B.M. 581"	584.69
Schoolhouse, district No. 12, Madison Township, about 120 feet northwesterly from; on cross mark of bronze tablet set horizontally in sandstone ledge on hillside about 225 feet right or east of road and about 75 feet higher than road, stamped "678 I"	681.057

MABEE, VIA GRAHAMSVILLE AND CAMBA, TO CLAY.

Mabee, 1.4 miles north of; on spike driven in small hickory stump 1 foot high and 6 inches in diameter, 11 feet west or left of road in woods, painted on fence "U.S.G.S. B.M. 813"	816.73
Grahamsville, about 1½ miles south of; on spike driven in root of oak tree standing in middle of road about 200 feet southwest of house of Andrew J. Graham on east side of road, painted white "U.S.G.S. B.M. 793"	796.32
White church on east side of road, about 1,500 feet north of; ⊞ chisel mark on sandstone ledge 18 feet right on east side of road and about 200 feet north of intersection of roads at top of hill, painted white "U.S.G.S. B.M. 874"	876.90
"Freedman Church," Franklin Township; on cross mark of bronze tablet set horizontally in center foundation stone between the two front doors of church, stamped "739 I"	742.958
Campbellite church 500 feet south of; ⊞ chisel mark on sandstone foundation at southwest corner of iron bridge	697.62
Hill (top of) 150 feet north of where a road turns to the east; a new frame house on west; ⊞ chisel mark on sandstone rock 8 feet left of road	823.12
Camba station and post-office, ¼ mile west of; on nail in top of old oak stump 8 feet left of road at bend of road, painted white "U.S.G.S. B.M. 758"	761.31
Camba, about 0.6 mile east of; ⊞ chisel mark on sandstone ledge 15 feet right of north and south road, and opposite road going east past church and schoolhouse, painted white "U.S.G.S. B.M. 770"	774.01

	Feet.
Camba, 2½ miles east of; ⊞ chisel mark on sandstone bowlder 2 feet from fence and 10 feet from log barn on south side of road; 4 feet west of gate into barnyard opposite a 1½-story frame house and 450 feet east of top of hill, painted "U.S.G.S. B. M. 832"	835.80
Clay, ¾ mile east of, on road to Madison Furnace; district schoolhouse No. 3, Madison Township; on cross mark of bronze tablet set in foundation stone under southwest corner, marked "745 I"	748.775

HALES CREEK, VIA SOUTH WEBSTER AND WAIT, TO SCIOTOVILLE.

Hales Creek station and post-office, on north side of road about ¼ mile west of; in Bloom Township; on copper bolt in extreme west end of perpendicular sandstone bluff about 50 feet high, on lands belonging to Mrs. Gertrude Kuhner; bench mark is about 64 feet above level of road, marked "714 I"	717.186
Sandstone rock at south end of small plank highway bridge 275 feet east of small house on north of road; ⊞ chisel mark on	638.50
Sandstone bowlder; ⊞ chisel mark on; boulder is at corner of picket fence around brick house on north side of road, about 75 feet east of house	646.30
South Webster, ¼ mile east of; ⊞ chisel mark on sandstone foundation at northeast corner of small highway bridge at crossing of Baltimore and Ohio Southwestern Railway	656.59
South Webster, about 0.3 mile west of; ⊞ chisel mark on sandstone foundation under southeast corner of new barn 40 feet right of road; locust trees around barn	767.59
Sandstone at northeast corner of small highway bridge; ⊞ chisel mark on; an old log house south of bridge	624.42
Scioto Furnace station on Baltimore and Ohio Southwestern Railway; ⊞ chisel mark on sandstone foundation at southwest corner of small wooden highway bridge, about 30 feet east of railroad bridge	594.87
Scioto Furnace station, 1,900 feet southwest of; on copper bolt in sandstone bowlder on side hill in partly wooded lot of Scioto Furnace Company, 30 feet higher than road and 125 feet south of road, marked "647 I"	650.836
Rock culvert, 12 feet right of road and between road and creek; ⊞ chisel mark on	692.75
Sandstone, 10 feet right of road and 200 feet west of forks of road; 1.14 miles from last bench mark; ⊞ chisel mark on	694.00
Highway bridge over stream at foot of long hill, 0.96 mile from last bench mark; ⊞ chisel mark at northeast corner of bridge on sandstone foundation	627.06
Railroad, 250 feet east of; 1.1 miles from last bench mark; on spike driven in base of telephone pole on right of road at bend of road to southwest.	575.02
Wait post-office, about 575 feet east of; ⊞ chisel mark on sandstone foundation at northwest corner of small wooden truss bridge over Wards Run	530.23
Wait post-office; ⊞ chisel mark on sandstone foundation at northeast corner of small wooden highway bridge 700 feet west of white house on north of road	530.59
Sciotoville, about 0.8 mile east of; on top of spike driven in top of stump about 4½ feet high on south side of road	557.29
Sciotoville; on cross mark of bronze tablet set horizontally in face of stone doorsill of front door of a two-story brick schoolhouse, marked "546 I"	549.895

SCIOTOVILLE VIA HARRISONVILLE (SCIOTO POST-OFFICE) TO FLAT.

	Feet.
Sciotoville, 1½ miles north of; + chisel mark on north end of upper chord (west side) of iron highway bridge over Bonsers Run	530.59
House (old frame) of Mr. Daum on west side of road; ⊞ chisel mark on large sandstone bowlder about 75 feet north of. Bench mark is between house and barn	556.21
Schoolhouse, 975 feet north of and 80 feet northeast of small shanty; bench mark is 10 feet west of road on spike driven in root of large maple tree and bent over	611.44
Harrison Township; ¼ mile south of top of hill opposite John Niner's home; on copper bolt in sandstone ledge 8 feet right or east of center of road. Road in narrow ravine, marked "788 I"	791.146
Sandstone ledge, ⊞ chisel mark on; 60 feet right of road across creek opposite forks of road; an old log house in forks of road	729.48
White house, 225 feet northwest of bench mark; ⊞ chisel mark on sandstone bowlder among a lot of bowlders on west side of road opposite a road going east	704.78
Harrisonville, ¼ mile south of; ⊞ chisel mark on sandstone bowlder at southwest corner of covered truss bridge over Longs Run	623.42
Harrisonville (Scioto post-office); ⊞ on cross mark of bronze tablet set horizontally in sandstone foundation under southwest corner of Knights of Pythias building (two-story frame building) on west side of street at, marked "654 I"	657.994
Rocky Fork; + chisel mark on head of iron bolt through foot of main brace of truss at northwest corner of covered bridge over	612.31
McConnells Creek, 90 feet west of main pike road to Flat; ⊞ chisel mark on sandstone foundation at southeast corner of covered truss bridge over	617.06
Bridge (small wooden highway); about 575 feet north of house on opposite side of road; ⊞ chisel mark on sandstone abutment at northeast corner of	645.08
Ryon post-office, 0.4 mile north of; ⊞ chisel mark on sandstone cover at east end of stone culvert under highway; 250 feet north of house on north side of road	661.51
Baptist church, 75 feet from southwest corner of; ⊞ chisel mark on sandstone rock at east end of stone culvert on east side of road	663.28
Scioto post-office and Flat post-office, on main pike road between; on cross mark of bronze tablet set in sandstone foundation under southwest corner of Baptist church in section 8, Madison Township, marked "665 I"	668.396
House (yellow) on west of road; ⊞ chisel mark on sandstone cover of stone culvert under highway; west end	684.78
Flat, ¼ mile south of; ⊞ chisel mark on sandstone foundation at southwest corner of small wooden bridge; bench mark is 2½ feet lower than bridge.	686.17

FLAT, VIA GALFORD TO GERMANY.

Flat; on small nail in root of maple tree 8 feet left of center of road and about ¼ mile northwest of top of hill	747.53
Roads, intersection of; 50 feet north of; ⊞ chisel mark on sandstone foundation at northeast corner of small wooden highway bridge	707.03
Galford, 0.9 mile north of; ⊞ chisel mark on sandstone in north end of stone culvert spanning ditch on east side of road; bench mark in front of log house	757.63
Bridge (small wooden highway); ⊞ chisel mark on sandstone foundation at southwest corner of; a white house 200 feet southwest of bridge	705.14

	Feet.
Germany; on cross mark of bronze tablet set horizontally in stone foundation under northwest corner of German Lutheran church; bench mark marked "675 I"	678.152

FLAT TO GRAHAMSVILLE.

Flat; on cross mark of bronze tablet set in stone lamp and hitching post in front of residence of E. V. Samson on north side of street, marked "732 I"	735.221
Beaver; church on corner where road turns north to; ⊡ chisel mark on west end of top step in front of west door of two front doors	756.02
Stone culvert under highway, about 125 feet west of end of east and west road; the pike road turns south and a road goes north; ⊡ chisel mark on sandstone cover of	740.80
Wooden bridge; ⊡ chisel mark on sandstone foundation at northeast corner of	678.32
Brushy fork of Little Scioto River; ⊡ chisel mark on sandstone rock at northwest corner of covered truss bridge over	622.01
Brushy Fork; ⊡ chisel mark on sandstone abutment at northwest corner of covered truss bridge over	629.66
Flat, 5¼ miles east of, on road from same to Grahamsville; 375 feet west of road crossing and small bridge over stream; Scioto Township; on cross mark of bronze tablet set in sloping fence of sandstone ledge, 7 feet north of center of road, marked "642 I"	645.192
Bridge (small wooden) over stream; ⊡ chisel mark on sandstone ledge on right of road, inside rail fence and 40 feet south of	726.71
Wooden bridge, small, opposite road going southwest; on spike driven in end of board at southeast corner of	742.89
Grahamsville post-office, ¾ mile west of; ⊡ chisel mark on sandstone ledge 10 feet north of road and 250 feet west of house on south of road	709.61
Grahamsville post-office, ¼ mile east of; ⊡ chisel mark on west end of lower step of three stone steps in front of porch of house of Martin Wastier and north side of road	842.81
Grahamsville post-office, 1¼ miles east of; on spike driven on root of white poplar stump 10 feet left of road and about 100 feet northwest of log house on south side of road; stump blazed and painted white "U.S.G.S. 890"	893.23

SCIOTOVILLE TO WHEELERSBURG.

Pirogue Run; ⊡ chisel mark on sandstone foundation at northeast corner of small iron highway bridge across	547.40
Wheelersburg; ⊡ chisel mark on sandstone foundation southwest corner of small iron bridge over Wheelers Run; steam gristmill just above bridge	535.81
Wheelersburg; ⊡ chisel mark on sandstone block near Cranston's brick store on northwest corner of intersection of streets at	559.07
Wheelersburg; on cross mark of bronze tablet in foundation sandstone under southwest corner of Baptist church, marked "561 I"	563.967

WHEELERSBURG EAST TOWARD CHAFFINS MILLS.

Wheelersburg, opposite Catholic church; ⊡ chisel mark on sandstone cover of stone culvert on west side of road	616.35
Bridge, small plank highway; ⊡ chisel mark on flat sandstone rock 3 feet north of end of bridge, 75 feet east of small wood-colored house on north side of road	563.22

	Feet.
Bridge, small wooden, southeast corner of; a two-story house 200 feet east; ⊞ chisel mark on sandstone foundation of	581.96
Porter Township; in rear of district schoolhouse No. 7. Bench mark is 90 feet in rear of schoolhouse and in a line with west side of same on copper bolt in sandstone ledge, marked "584 I"	587.878

WHEELERSBURG TO HAVERHILL.

Powellsville, third telephone pole south of road going east to; on spike driven horizontally in telephone pole on west side of road	538.32
Pine Creek; ⊞ chisel mark on sandstone foundation at southeast corner of large iron bridge across	532.63
Brick house on east side of road, 1.11 miles from last bench mark; + chisel mark on stone in front-gate entrance in front of	570.84
Watering trough, about 400 feet north of; ⊞ chisel mark on cover of stone culvert under highway east side of road; 0.91 mile from last bench mark.	549.80
Franklin Furnace Station, nearly opposite; ⊞ chisel mark on sandstone ledge 40 feet east of road; 20 feet north of small stone culvert	580.28
Railroad crossing, about 875 feet north of; ⊞ chisel mark on rock on east side of road in front of blue-colored house on same side	543.89
Bowlder (small) on east side of road about 600 feet south of intersection of; ⊞ chisel mark on	545.15
Genatts Creek; ⊞ chisel mark on sandstone foundation of covered truss bridge over, at northeast corner of, 1,700 feet south of schoolhouse	531.16
Haverhill, 1.6 miles northwest of; on top of iron post buried in ground, 2½ feet west of fence line on west of road and 8 feet north of north gate-post, entrance to Joshua Oakes & Sons Drain Tile and Red Brick Factory in Green Township, Scioto County, marked "546 I"	549.927
Haverhill, 1 mile northwest of; stone culvert under highway 1.06 miles from last bench mark; ⊞ chisel mark on sandstone cover west end of	544.98
Haverhill; ⊞ chisel mark on stone step in front of small brick store opposite road going down to Ohio River ferry	551.99

HAVERHILL, OHIO, VIA GREENUP, KENTUCKY, TO MOUTH OF WHETSTONE CREEK.

Greenup; Greenup County building; on bronze tablet set vertically in stone step at right of entrance to clerk's office, marked "538 I"	541.105
Greenup, 1.1 miles southwest of; + chisel mark on bowlder 6 feet left of center of road; 350 feet south of house of Orman Nichols; ravine coming in from west; painted white, "U.S.G.S. B. M. 568"	571.53
Greenup, 2½ miles southwest of; about 750 feet southwest of log house on north of road; on cross mark of bronze tablet set horizontally in south end of large sandstone bowlder about 25 by 10 by 7 feet right of north center of road, marked "578 I"	581.182
Whetstone Creek, about 400 feet below mouth of; ⊞ chisel mark on bowlder 6 feet left of road; painted white, B.M. "541"	544.77

HAVERHILL, EASTWARD TO OLD OHIO FURNACE.

Sandstone bowlder on south side of road about 5 feet from fence in front of a small house on same side of road; ⊞ chisel mark on	549.22
Genatts Creek, 8 feet from northwest corner of small wooden highway bridge across; ⊞ chisel mark on sandstone abutment	599.36
Haverhill, 3.2 miles northeast from and about 500 feet from brick store; on copper bolt on sandstone ledge 35 feet south of road, marked "619 I".	622.331

HAVERHILL TO IRONTON.

	Feet.
Haverhill, 1½ miles southeast of; stone monument marking line between Lawrence and Scioto counties, on right of road and about 300 feet southeast of brick house on left of road; ⊞ chisel mark on top of monument	549.25
Haverhill, 2.3 miles southeast of; telephone pole 1.32 miles from last bench mark on left or south of road opposite a white house 300 feet back from road on right; on spike in stump of telephone pole	542.06
Hanging Rock, 2.6 miles northwest of; church, brick (Ohio Baptist, 1864) 0.83 mile from last bench mark, on copper bolt in southeast corner of top step of three stone steps in front of front door of, marked "551 I"	554.287
Hanging Rock, 1¾ miles northwest of; ⊞ chisel mark on bowlder in pasture field about 75 feet right of road and 35 feet right of Norfolk and Western Railway, about 500 feet northwest of railway crossing, and 1.48 miles from last bench mark	556.03
Hanging Rock, about ¼ mile northwest of; on top of iron bolt in sill of Norfolk and Western Railway trestle bridge, 0.97 mile from last bench mark; at right of road, south side of track, overhead crossing of railway	532.28
Ironton, 2.3 miles northwest of; ⊞ chisel mark on stone wall in front of white brick house 1.32 miles from last bench mark on south side of road; about 100 feet west of gateway to barn	541.41
Ironton, 1 mile northwest of; on top of spindle of hydrant about 100 feet southeast of electric-car house, on north side of street and car line	540.78
Ironton, court-house yard; cross (×) mark on southwest corner top stone step in southeast corner of	543.72
Ironton, northwest corner Fourth and Railroad streets; bronze tablet in southeast corner of Memorial Hall and Public Library	547.378

IRONTON, VIA HECLA, ROCK CAMP, AND ANDIS, TO AID.

Ironton, ¼ mile north of; southwest corner foundation stone under southwest corner sheet-iron powder house, fourth powder house north from Park Avenue highway tunnel	588.43
Ironton, 1.8 miles north of; at Old Maidsville; southeast corner of store of W. R. Richardson on north side of highway; × mark on foundation stone	541.39
Ironton, 1.9 miles north of, at Sulphur Spring; cross (×) marked on rock beside Sulphur Spring	545.37
Hecla Furnace; on copper bolt in foundation stone of smokestack, marked "604 I"	607.31
Hecla Furnace, ½ mile east of; on spike in sycamore tree	642.24
Hecla Furnace, 1½ miles east of; on spike in root of tree on west side of highway 800 feet from Marion pike	604.16
Hecla Furnace, 2.36 miles east of; on sandstone bowlder on right of highway 30 feet northwest from dead tree	586.35
Hecla Furnace, 2.88 miles east of; on spike in root of wild cherry tree 425 feet northwest of residence of Elizabeth Gannon	592.72
Hecla Furnace, 3.96 miles east of; on spike in root of mulberry tree on east side of highway 0.12 mile southwest from residence of Eleanor Fetter	606.11
Hecla Furnace, 5.53 miles east of; on spike in abutment of approach to foot log over Ice Creek; 0.11 mile northeast of residence of John Ball, north side of highway, 1 mile from Johnstown	572.42
Johnstown; Marion Pike and Ice Creek road, 270 feet south of junction of; cross mark on girder rest over 3-inch nut on northeast corner of bridge over Big Ice Creek at	593.76

	Feet.
Johnstown, 0.15 mile northeast of; on spike in crook of 7-inch sycamore tree on east side of highway	591.78
Rock Camp, Perry Township, 100 feet northeast of Union Hall; on copper bolt in stone abutment of bridge over Crazy Creek, marked "601 I"	604.584
Rock Camp, 1.4 miles from; on sandstone bowlder west side of highway.	648.84
Andis cross roads; on stone abutment of bridge over Ice Creek at	673.96
Andis post-office, left of road, north of; spike driven in sawed-off sprout of elm tree	717.47
Andis; on spike in root of walnut tree	916.62
Aid post-office, 2.17 miles southwest of; on sandstone bowlder 10 feet left of center of road near foot of long hill; marked □ with chisel	700.18
Symmes Creek, at southwest corner of small wooden truss bridge over tributary of; □ chisel mark on abutment stone. Symmes Creek is a stream coming in from west at bridge	603.09
Aid post-office, ½ mile from; □ chisel mark on stone foundation at northeast corner of small wooden truss bridge over tributary of Symmes Creek	582.82
Aid post-office; □ chisel mark on bowlder at end of wing wall of abutment northeast corner of large covered bridge over Symmes Creek	585.53

AID, VIA ARABIA AND SHERRITTS, TO CAMPBELL.

Aid post-office, 2½ miles from southeast corner of store of T. H. Neal; on copper bolt in sandstone bowlder, marked "581 I"	584.948
Aid post-office, ½ mile north of; on nail in root of large lone beech tree in field, 60 feet west of center of road	586.02
Aid post-office, 1½ miles north of; on nail in root of north one of two large beech trees 10 feet apart and about 20 feet left of road on bank of Symmes Creek; about 550 feet north of iron bridge over Symmes Creek	579.81
Aid post-office, 2.3 miles northwest of; □ chisel mark on sandstone ledge 15 feet right of road and about 300 feet below brick house on right	629.49
Symmes Creek, covered wooden truss bridge over, near mouth of Elkins Creek; ⊞ chisel mark on sandstone bowlder on northwest corner of bridge	590.92
Symmes Creek, 1,035 feet west of bridge over; copper bolt in large sandstone bowlder 15 feet long, 0.20 mile from last bench mark, marked "622 I"	625.019
Wooden bridge (small) northeast corner of; ⊞ chisel mark on sandstone bowlder; a log house on left, 250 feet west	588.60
Sandstone bowlder, 0.38 mile from last bench mark, 8 feet left of road; ⊞ chisel mark on	620.93
Sandstone bowlder, 0.92 mile from last bench mark; ⊞ chisel mark on; northeast corner small wooden bridge, about 400 feet west of a white house on left	598.79
Sandstone bowlder, 0.81 mile from last bench mark; ⊞ chisel mark on; northwest corner of wooden truss bridge over Aarons Creek	598.03
Arabia; iron bridge over Symmes Creek, 1.03 miles from last bench mark; ⊞ chisel mark on sandstone bowlder in wing wall 20 feet from northwest corner iron bridge	603.06
Arabia, 1.1 miles north of; ⊞ chisel mark on sandstone bowlder, 1.07 miles from last bench mark, at west end of stone culvert west side of road	599.12
Arabia, 2 miles north of; Johns Creek, about 400 feet north of covered bridge over, and about 225 feet south of forks of road (right to Waterloo and left to Sherritts), on spike in root of large oak tree on west of road.	598.84
Sherritts, 1.8 miles south of; sandstone foundation at south end of small wooden bridge; ⊞ chisel mark on; a white house, with brown trimmings but no blinds. about 200 feet northeast on right side of road	610.37

	Feet.
Sherritts, 0.9 mile south of; ⊞ chisel mark on sandstone ledge on north side of road; about 200 feet northwest of white house on south side of road	626.74
Sherritts, 100 feet south of post-office and store; ⊞ chisel mark on sandstone foundation at northeast corner of small wooden bridge	631.53
Sherritts, ¼ mile north of; Johns Creek, south bank of; 430 feet southeasterly from wooden truss bridge over Johns Creek, on land of H. J. Wiseman; copper bolt in sandstone ledge, marked "614 I"	617.533
Sherritts, 1.4 miles northeast of; 0.20 mile beyond schoolhouse; ⊞ chisel mark on sandstone ledge just right of wagon track	658.16
Sherritts, 3 miles northeast of; solid sandstone ledge 6 feet right of center of road, 1.60 miles from last bench mark; ⊞ chisel mark on ledge; road runs in bed of stream	648.88
Campbell, 4½ miles east of; ⊞ chisel mark on sandstone ledge 8 feet right of road and 0.68 mile from last bench mark; road runs over the ledge	666.27
Campbell, 3.65 miles east of; ⊞ chisel mark on sandstone ledge 12 feet right of road, at place where road crosses creek, and 0.83 mile from last bench mark; log house 350 feet west on north side of road	707.69
Campbell, 2.9 miles east of; ⊞ chisel mark on sandstone bowlder 5 feet right of center of road, 0.58 mile east of road corner at top of hill, and 0.76 mile east from last bench mark	779.57
Campbell post-office, ¼ mile south of; ⊞ chisel mark on bowlder in bank of railroad cut 210 feet right of road and 1 25 miles from last bench mark	692.95

CAMPBELL, VIA ORT, CULBERTSON, AND PEDRO, TO HECLA.

Campbell; ⊞ chisel mark on stone doorstep in front of east door of brick building (store and post-office, Campbell) facing nearly south	683.66
Campbell, 0.33 mile southwest of; on copper bolt in sandstone foundation of small wooden bridge and at northeast corner of bridge, marked "687 I"	690.468
Campbell, 1.2 miles south of; ⊞ chisel mark on sandstone foundation of small wooden highway bridge, 0.88 mile from last bench mark; a ravine coming in from southeast	735.71
Campbell, 2.3 miles south of; ⊞ chisel mark on large sandstone bowlder, 1.09 miles from the last bench mark, in bank 12 feet right of road, about ½ mile south of top of hill	897.33
Ort post-office, about ½ mile north of; ⊞ chisel mark on sandstone cover of stone culvert under highway at east end of culvert	697.54
Ort post-office, 1½ miles south of; ⊞ chisel mark on sandstone foundation of wooden highway bridge at southeast corner of; limestone-quarry switch, Cincinnati, Hamilton and Dayton Railway, and 1.15 miles from last bench mark	633.15
Bartles Station (near) about 800 feet south of white schoolhouse and about 0.76 mile from last bench mark; ⊞ chisel mark on sandstone foundation at southeast corner wooden truss highway bridge	616.59
Lawrence Furnace, about ½ mile north of; 0.96 mile from last bench mark; ⊞ chisel mark on sandstone foundation at northeast corner of small wooden truss highway bridge	603.39
Culbertson post-office; 0.30 mile east of, and 1.01 miles from last bench mark; ⊞ chisel mark on shale ledge about 12 feet left of road and about 300 feet west of top of hill	693.25
Pedro, 1½ miles north of; ⊞ chisel mark on sandstone foundation at northeast corner of small wooden truss highway bridge, 0.58 mile from last bench mark	604.47

	Feet.
Pedro post-office, about ¼ mile west of; ⊞ chisel mark on sandstone foundation of, and at northwest corner of small wooden highway bridge	614.29
Pedro post-office, about ¼ mile southwesterly of; copper bolt in solid sandstone ledge 15 feet east of road, marked "622 I"	525.907
Ellisonville; ⊞ chisel mark on sandstone foundation at northwest corner of small wooden highway bridge	650.14
Ellisonville, 0.8 mile southeast of; ⊞ chisel mark on sandstone cover at east end of stone culvert under highway, 0.79 mile from last bench mark; oak tree at west end of culvert	702.72
Storms Creek, ¼ mile north of; ⊞ chisel mark on sandstone cover at west end of stone culvert under highway	606.95
Hecla, 2 miles northwest of; ⊞ chisel mark on sandstone foundation at northeast corner of small wooden highway bridge about 150 feet from schoolhouse on east side of road and 1.18 miles from last bench mark	559.86
Hecla, 1¼ miles northwest of; ⊞ chisel mark on sandstone foundation at northwest corner of small wooden highway bridge and 0.77 mile from last bench mark; a house on east 175 feet south	617.13
CAMPBELL TO OLIVE FURNACE.	
Campbell, 1.1 miles north of; 500 feet south of J. F. Hall Coal Company's store; ⊞ chisel mark on sandstone cover at west end of small culvert under highway	667.07
Olive Furnace, 1.8 miles south of; frame house on east side of road, about 350 feet south of, and 1.20 miles from last bench mark; ⊞ chisel mark on sandstone ledge on east side of road	672.34
Olive Furnace, 1.1 miles south of; water tank on Cincinnati, Hamilton and Dayton Railway; ⊞ chisel mark on sandstone ledge 8 feet right of road and about 120 feet northeast of railroad water tank	657.86
Olive Furnace post-office; ⊞ chisel mark on stone block beside locust tree 12 feet from southeast corner of brick store	676.47
OAK HILL CROSSING, VIA THURMAN, RIO GRANDE, AND RODNEY, TO GALLIPOLIS.	
Cincinnati, Hamilton and Dayton Railway, 1.2 miles east of; rounded point on root of large maple tree 15 feet north of road	705.3
Cincinnati, Hamilton and Dayton Railway, 2½ miles east of; nail in root of large oak tree 25 feet north of road	672.24
Thurman, 2¾ miles west of; ⊞ chisel mark on sandstone at southwest corner of covered bridge over Symmes Creek	654.36
Thurman, 2 miles west of; ⊞ chisel mark on sandstone ledge 12 feet east of road	658.46
Thurman post-office, 1,050 feet northwest of; ⊞ chisel mark on sandstone foundation at northwest corner of wooden bridge at forks of road	659.86
Thurman post-office, 900 feet southeast of; ⊞ chisel mark on capstone of drain 15 feet south of road; 4½ feet from gate entering field	661.06
Thurman schoolhouse; in foundation stone on side facing southwest; bronze tablet marked "696 A"	695.862
Thurman, 1.3 miles southeast of; ⊞ chisel mark on sandstone at southeast corner of iron bridge, near coal scales	648.08
Rio Grande, 2 miles west of; ⊞ chisel mark on capstone of south end of drain under highway about 500 feet west of summit in road	707.
Rio Grande, 0.75 mile north of; ⊞ chisel mark on sandstone foundation at northeast corner of small wooden bridge 125 feet northeast of brick house and 100 feet south of bridge on road going east	597.83
Rio Grande; in sandstone wing wall at right of steps north entrance to main building, Rio Grande College; bronze tablet marked "682 A"	682.032

	Feet.
Rio Grande, 1 mile east of; ⊞ chisel mark on sandstone foundation at southeast corner of small wooden bridge; brick house on north and barns on south	626.66
Rio Grande, 1.85 miles east of; ⊞ chisel mark on sandstone foundation at northwest corner of large covered bridge over Raccoon Creek	594.75
Rio Grande, 2¼ miles southeast of; chisel mark on capstone at north end of stone culvert	601.54
Rodney, 0.9 mile west of; ⊞ chisel mark on sandstone cover at south end of stone culvert	614.60
Rodney, 0.4 mile east of; ⊞ chisel mark on sand rock at northwest corner of small wooden highway bridge	683.32
Rodney, 1½ miles east of; ⊞ chisel mark on sandstone cover of pipe drain in front of small brown house on north side of road	635.20
Rodney, 2 miles east of; in sandstone doorsill in front door of brick house on north of road, belonging to R. B. Waddell; bronze tablet marked "671 A"	671.145
Rodney, 3 miles east of; ⊞ chisel mark in sandstone cover at north end of culvert under highway; white house with green blinds 300 feet northwest.	589.20
Gallipolis, 3.6 miles northwest of court-house; ⊞ chisel mark on southeast corner of wooden truss bridge 875 feet west of railroad crossing	565.01
Gallipolis, 2.4 miles northwest of court-house; ⊞ chisel mark on sandstone foundation at northeast corner of small iron highway bridge	568.05

GALLIPOLIS, VIA POINT PLEASANT, WEST VIRGINIA, TO LOCK NO. 11.

Gallipolis, 0.9 mile northwest of court-house; spike in small stump of locust tree about 40 feet north of road between main track of Columbus, Hocking Valley and Toledo Railway and spur running to Epileptic Hospital.	573.25
Gallipolis, about 1½ miles north of court-house; State Epileptic Hospital grounds; in foundation wall at southwest corner of chapel and women's dining-room building; in third course of stone from pavement; bronze tablet marked "606 A"	605.852
Point Pleasant, 2¼ miles south of; ⊞ chisel mark on northeast corner of stone doorstep in front of house on street corner about 150 feet north of entrance to "Lakewood Park"	566.72
Point Pleasant, 1.4 miles south of; ⊞ chisel mark on sandstone foundation at southwest corner of wooden highway bridge	557.74
Point Pleasant (Ohio side); spike in doorsill left side of doorway of waiting room at end of electric-car line	558.72
Point Pleasant, West Virginia; ⊞ chisel mark on pavement stone 6 inches from corner of building at northeast corner of Main and First streets..	562.99
Point Pleasant, West Virginia; in west face of "cornstalk" monument in court-house yard; 100 feet west of Mason County court-house; bronze tablet marked "570 A"	570.356
Point Pleasant, 1.1 miles north of; spike in old post 6 inches high near fence on north of road, 12 feet northwest of telephone pole No. 9040....	564.18
Lock No. 11 on United States Engineers gage, 25 feet above the zero, which is given by inspector at 510.083	539.863

NORTH CAROLINA.

BUNCOMBE, HAYWOOD, HENDERSON, TRANSYLVANIA, AND JACKSON COUNTIES.

ASHEVILLE AND PISGAH QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the corner post of the train shed at Asheville and marked "1986." The elevation of this bench mark is accepted as 1,985.650 feet above

mean sea level, as determined by precise levels run by Mr. W. C. Hall, topographer of this Survey, from a tidal gage at Morehead City, North Carolina. (See Appendix to Eighteenth Annual Report, U. S. Geol. Survey, pp. 234, 295.) The leveling was done under the direction of Mr. W. L. Miller, topographer, by Mr. Thomas S. Mauldin, jr., levelman.

The leveling done during this season was based on permanent bench marks established by this Survey in 1896 and published in the Eighteenth Annual Report, and these elevations accord with those published in that report. As stated therein, however, the datum was changed as a result of Mr. Hall's precise levels, and in consequence the bench marks established in 1896, while correctly published in the Eighteenth Annual Report, are stamped in accordance with the previous erroneous datum, and therefore their markings do not agree with those stamped during the year 1897, as published below. These latter are marked with the datum initial "A" in addition to their figures of elevation.

ASHEVILLE TO WAYNESVILLE, VIA CANDLER AND CANTON, ALONG MURPHY BRANCH, SOUTHERN RAILWAY.

	Feet.
Asheville, 19.3 feet north of north rail, 505 feet east of milepost 141, in pedestal block northeast corner post of train shed; bronze tablet marked "1986 A"	1,985.650
Asheville, highway bridge across French Broad River; marked point on end of east wing of abutment at north end of bridge	1,981.41
Asheville, third grade crossing, 1¼ miles west of station; nail in root of oak, south edge of public road, 80 feet west of crossing; tree blazed and marked "2024"	2,024.25
Enma, ¼ mile west of; marked point on rock 5 feet south of track in cut.	2,096.38
Three-mile post, 125 feet west of trestle west of; marked point on rock 5 feet south of south rail	2,075.03
Carriers Spring, 100 feet south of track at crossing; nail in root of large oak in fork of road; tree blazed and marked "2140"	2,140.49
Acton, 300 feet east of crossing, 75 feet southeast of track and 15 feet southwest of pasture fence; nail in root of large oak tree, blazed and marked "2104"	2,103.67
Hendersonville road, ¼ mile east of fork of, midway between two grade crossings, on south edge of public road; top of bronze cap on iron bench mark post in fence corner, marked "2082 A"	2,081.731
Eight-mile post, 630 feet east of; nail in root of peach tree 15 feet north of track	2,083.43
Hominy, 275 feet east of east end of station, 50 feet south of track in field; nail in root of small maple tree, blazed and marked "2101"	2,100.86
Candler, 40 feet south of track, 125 yards west of post-office, at fork of road to Dunsmore; nail in root of small white oak tree, blazed and marked "2110"	2,109.80
Eleven-mile post, 900 feet west of, at crossing of private road, 25 feet northwest of track; nail in root of small wild cherry tree, blazed and marked "2149"	2,149.23
Luthers, 1,475 feet west of crossing, 30 feet south of track, inside pasture fence; nail in root of large locust tree, blazed and marked "2188"	2,187.79
Turnpike, copper bolt, in rock on north edge of public road, east of branch flowing into North Hominy Creek, and just south of switch; bolt is stamped "2259 A"	2,258.672
Fifteen-mile post, 40 feet east of first crossing west of; marked point on rock 5 feet south of track	2,334.30

	Feet.
Sixteen-mile post, 930 feet west of; marked point on rock 5 feet north of track	2,417.85
Canton, 200 feet east of crossing at, and 60 feet south of track, on south edge of public road; nail in root of apple tree blazed and marked "2559"	2,558.81
Canton, 30 feet south of railroad, 25 feet east of public road, at east end of railroad bridge over Pigeon River; top of bronze cap on iron bench-mark post marked "2587 A"	2,586.871
Twenty-mile post, 840 feet east of, 20 feet north of railroad and 10 feet south of public road; nail in root of oak tree blazed and marked "2653"	2,652.76
Twenty-three mile post, 100 feet west of and 20 feet north of north rail; nail in trunk of wild cherry tree	2,538.87
Twenty-four mile post, 100 feet west of and 100 feet south of track at west edge of path; nail in root of small oak tree blazed and marked "2630".	2,630.10
Tuscola, 300 feet east of post-office, 10 feet south of center of public road, and 25 feet east of building; top of bronze cap on iron bench-mark post marked "2595 A"	2,594.984
Tuscola, 1 mile west of; 630 feet north of north end of trestle and 30 feet west of track in field; nail in root of large apple tree blazed and marked "2598"	2,597.81
Waynesville, 4,500 feet northeast of station at, 300 feet north of shanty on west side of track, and 5 feet east of track; marked point on rock	2,615.73
Waynesville, 135 feet north of station, 40 feet east of main track; top of bronze cap on iron bench-mark post marked "2638 A"	2,638.334

CANDLER TO DUNSMORE, VIA GLADY.

Candler, ¼ mile from, on bank, west edge of road, at bend; nail in root of oak tree, blazed and marked "2136"	2,136.11
Candler, 1¼ miles from; nail in root of small oak tree 20 feet northwest of road in yard in front of small house near top of hill	2,332.73
Candler, 2 miles from, on west edge of road between two streams flowing southeast; nail in root of tree blazed and marked "2245"	2,245.53
Glady, 30 feet northwest of corner of store; nail in root of large white oak tree blazed and marked "2349"	2,348.86
Candler, 3⅜ miles southwest of; 550 feet east of fork of roads to north; 15 feet north of road on north edge of ditch; highest point of rock	2,283.51
Candler, 4 miles southwest of, at crossroad and ford by store; nail in root, about 2½ feet from trunk of old white oak tree, blazed and marked "2259"	2,259.43
Candler, 4½ miles from, at top of hill by church, on southeast edge of road; nail in root of large walnut tree blazed and marked "2318"	2,318.50
Dunsmore, 250 feet east of ford of Stony Fork, inside of pasture fence, south of road, in large rock; copper bolt marked "2388 A"	2,388.384

CANTON TO LENOIR CREEK, VIA FORKS OF PIGEON.

Canton, 1,000 feet south of fork in front of Wells's store, 10 feet west of road at bend on hill by river; nail in root of small oak tree blazed and marked "2627"	2,626.75
Canton, 1 mile south of, on east edge of road at foot of hill; nail in root of large white oak tree blazed and marked "2616"	2,616.49
Canton, 2 miles south of; 100 yards south of top of small hill just south of branch; marked point on rock, east edge of road	2,633.67
Canton, 3½ miles south of; 100 yards north of dwelling at top of hill, about 20 feet west of road; nail in root of large oak tree blazed and marked "2744"	2,744.43

	Feet.
Canton, 4 miles south of; 300 yards south of Trull's store at crossroads on east edge of road; nail in root of oak tree blazed and marked "2653"	2,652.65
Canton, 4½ miles south of; nail in root of small oak tree on bank east of road at fork of road to Waynesville, blazed and marked "2685"	2,684.84
Pigeon, ¾ mile north of fork of road to; nail on root of oak blazed and marked "2698" at fork of road	2,698.12
Canton, 5¾ miles south of and ¼ mile south of fork of road to Blaylock Mill; 100 feet south of top of hill, on bank at west edge of road; nail in root of oak tree blazed and marked "2761"	2,761.40
Dick Creek, opposite fork of road up; nail in root of tree blazed and marked "2683" on north side of road	2,682.99
Lenoir Creek, ¾ mile northwest of; 75 feet east of crossing of old creek bed at 9-mile post to Waynesville, on north side of road; nail in root of large sycamore tree blazed and marked "2712"	2,712.46
Lenoir Creek, 200 yards from mouth of; 50 feet east of ford of East Fork of Pigeon River, in rock on north side of river; copper bolt marked "2737 A"	2,736.749

WEST FORK OF PIGEON RIVER, VIA RETREAT, TO LAVINIA.

Canton, 4 miles south of, 50 feet west of river on east edge of road at ford; nail in root of large hickory tree blazed and marked "2639"	2,639.38
Sonoma, 500 feet north of top of hill in front of Methodist church at Bethel, on west edge of road; nail in root of white oak tree blazed and marked "2686"	2,686.33
Sonoma (Bethel), 1 mile from fork of road at; nail in root of large oak tree on river bank, 15 feet east of road, tree blazed and marked "2689"	2,688.69
Sonoma (Bethel), 1½ miles from Methodist church at; highest point of rock south of road at fence corner at bend of road by dwelling	2,704.06
Sonoma (Bethel), west edge of road 100 yards south of fork of road to Waynesville; nail in root of white oak tree blazed and marked "2742"	2,742.33
Retreat (Edmondsons), ¼ mile south of, on west edge of road at top of hill in front of schoolhouse; nail in root of oak tree blazed and marked "2855"	2,855.56
Bethel, 3½ miles south of, about 15 feet north of road on north side of river at ford, on bank; nail in root of oak tree blazed and marked "2768"	2,768.58
Little East Fork of Pigeon River, 100 yards west of fork of road up, on north edge of road; nail in root of large chestnut tree blazed and marked "2835"	2,835.40
Little East Fork and West Fork of Pigeon River, ¼ mile from confluence of, ¼ mile south of upper ford, about 25 feet east of road, in field; highest point of large rock	2,881.81
Lavinia, 25 feet north of branch crossing just south of Pendleton's house; copper bolt, in rock, marked "2931 A"	2,930.645

UP LITTLE EAST FORK OF PIGEON RIVER.

West Fork and Little East Fork, 1 mile south of fork of roads up; nail in root of tree blazed and marked "2926," 15 feet east of road, about 225 feet south of fifth ford, and 40 feet north of small branch crossing road.	2,926.26
West Fork and Little East Fork, 2½ miles south of fork of roads up; 60 feet west of crossing of branch in front of schoolhouse; nail in root of white-oak tree blazed and marked "3018"	3,017.62
Little East Fork, ¼ mile south of ford of and 3 miles south of fork of roads up West Fork; copper bolt in rock about 10 feet west of road and about 50 feet north of crossing of branch, marked "3127 A"	3,126.696

LINE UP BENT CREEK FROM 3 MILES NORTH OF AVERY.

	Feet.
Asheville-Brevard road, 1½ miles from, on road to Bent Creek; nail in root of large oak tree on north edge of road at fork on top of hill, blazed and marked "2195"	2,194.69
Asheville-Brevard road, 2⅛ miles from, on road to Bent Creek; nail in root of large oak tree west of road, 100 yards south of top of hill, blazed and marked "2231"	2,230.82
Asheville-Brevard road, 2½ miles from, at Bent Creek; nail in root of large oak tree, 20 feet northwest of old mill at bend in road; tree blazed and marked "2154"	2,154.08

FROM 3 MILES WEST OF ECUSTA, ON DAVIDSONS RIVER, VIA AVERY CREEK AND CHUBBS GAP, TO THE PINK BEDS.

Avery Creek, 1½ miles from confluence of, with Davidsons River; nail in root of large beech tree 25 feet southwest of road on bank of Avery Creek and about 200 yards above house at third ford; tree is blazed and marked "2290"	2,289.50
Avery Creek, 1½ miles from confluence of, with Davidsons River; nail in root, north side of apple tree, by fence, north edge of road, 150 feet west of fifth ford	2,325.75
Avery Creek, 2⅛ miles above confluence with Davidsons River; nail in root of large spruce pine, on west edge of road at ford, blazed and marked "2388"	2,388.20
Avery Creek, 2⅝ miles above confluence with Davidsons River; highest point of large rock at east edge of branch, crossing road at house	2,448.89
Avery Creek, 3½ miles from confluence with Davidsons River; nail in root of maple on northeast edge of road; maple is blazed and marked "2583"	2,583.01
Avery Creek, 4⅛ miles from confluence with Davidsons River; nail in root of tree southwest edge of road 200 feet above sharp bend, ⅛ mile above old house at foot of mountain; tree blazed and marked "3078"	3,077.75
Chubb Gap, ⅛ mile from summit of; nail in root of chestnut tree, 10 feet southwest of center of road at bend; tree blazed and marked "3428"	3,427.83
Chubb Gap, 50 feet north of summit; nail in root of large oak tree, east edge of road; tree blazed and marked "3790"	3,789.69
The Pink Beds, ⅛ mile west of Sorrell's house; nail in root of large chestnut on east edge of road at fork of road; tree blazed and marked "3307".	3,306.99
The Pink Beds, directly in front of Sorrell's house; top of bronze cap on iron bench mark post, in fence corner, north of road, marked "3278 A".	3,277.794

FROM MOUTH OF AVERY CREEK, 3 MILES WEST OF ECUSTA, WESTWARD ALONG DAVIDSONS RIVER.

Avery Creek, 2 miles from copper plug at mouth of; 200 feet east of fourth ford west of fork of road to Pink Beds; nail in root of large tree south side of road	2,244.27
Looking Glass Creek, 100 feet east of first ford west of mouth of; nail in root of small maple tree 50 feet north of road; tree blazed and marked "2272"	2,271.85
Pink Beds, 200 feet east of thirteenth ford west of fork of road to, and 3½ miles from same; nail in root of large beech tree; blazed and marked "2293," 30 feet south of road	2,293.30
Pink Beds, 4½ miles west of fork of road to and 200 feet west of ford; nail in root of large poplar tree, blazed and marked "2329," 25 feet south of road	2,329.27
Pink Beds, 5½ miles west of fork of road to; nail in knee on trunk of small dogwood tree on south edge of road, 150 east of sharp bend in road	2,612.97

	Feet.
Pink Beds, 6¼ miles west of fork of road to; 400 feet east of corner of field at top of hill; nail in root of large white oak tree, blazed and marked "2754," southwest edge of road	2,753.51
Avery Creek, 6¾ miles west of mouth of, in fork of road down to river at top of hill; nail in root of large oak tree, blazed and marked "2882"	2,881.76
Davidsons River, 375 feet west of ford of; nail in root of large white oak tree, blazed and marked "2581," north of road	2,581.34
Looking Glass Creek, 4 miles west of mouth of; 375 feet west of ford of Davidsons River, 15 feet north of road; copper bolt in large mass of rock, on which a large chestnut tree is growing; bolt is stamped "2588 A"	2,588.058

BALSAM GROVE LINE.

Tuckers (Robinsons Mill) Creek, 800 feet from ford of; nail in root of sycamore tree on bank east of road, and blazed and marked "2692"	2,691.65
Balsam Grove, 1 mile south of, at fork of road to; nail on root of oak tree, blazed and marked "2884"	2,884.27
Tuckers Creek, 3.1 miles from mouth of; top of bronze cap on iron post in fork of road near ford of north fork of creek; marked "2976 A." An oak tree 4 feet west of post is blazed and marked "2976"	2,975.997

TENNESSEE AND GEORGIA.

Precise-Level Line.

PAINT ROCK, VIA KNOXVILLE, CLEVELAND, AND ROME, TO ATLANTA.

The elevations in the following list were determined in continuation of the line of precise levels run in 1896 from mean sea level at Morehead City, North Carolina, via Salisbury and Asheville, to Paint Rock. The route of leveling was along the main line of the Southern Railway. The elevations are based on the same datum as used during the previous field season, namely, a bronze tablet in Morehead City, the elevation of which is 17.763 feet above mean sea level as determined from the tide gage established on the pier of the Atlantic and North Carolina Railroad at Morehead depot.

The leveling was done by Mr. W. Carvel Hall, topographer, assisted by two rodmen, Messrs. Ross M. Sutton and Ed. Trabue, and was done under the general direction of H. M. Wilson, geographer.

The bench marks placed in the progress of this work are marked with the datum initials "M. C." in addition to the figures of elevation.

TENNESSEE.

PAINT ROCK TO MORRISTOWN.

	Feet.
North Carolina-Tennessee State line, north rail	1,255.39
French Broad River, five-span bridge, 714 feet long; top of north rail at east end	1,251.90
French Broad River, four-span bridge, 554 feet long; top of north rail at east end	1,239.15
Wolf Creek station; top of north rail in center of 90-foot trestle over Wolf Creek	1,193.98

	Feet.
Wolf Creek station, 0.75 mile west of; 10.5 feet south of north rail, 200 feet west of road crossing; copper bolt in solid rock, marked "1184 M. C."	1,184.157
Swatsell; top of north rail opposite station sign	1,173.86
Delrio; top of north rail, main track, opposite station	1,141.16
Big Creek bridge (No. S. 195.3), west abutment, north wing wall, 12 feet north of north rail; copper bolt, marked "1141 M.C."	1,140.896
Bridgeport, top of north rail of main track, opposite station	1,087.26
Bridgeport; 72.7 feet south of north rail of main track; center pilaster of J. B. Huff's brick store; bronze tablet, marked "1094 M.C."	1,094.511
Pigeon River, bridge No. S. 205.4; top of north rail at west end	1,089.68
Newport, Cocke County court-house; bronze tablet in northeast corner of building, 6.5 feet above surface of ground, and marked "1058 M.C."	1,058.204
Newport; top of north rail, main track, opposite station	1,051.83
Rankin, 125 feet south of north rail of main track, 95 feet west of road crossing; bronze tablet, in face of bay window of W. V. Fine's brick residence, marked "1010 M.C."	1,010.028
French Broad River, bridge No. S. 216.0; top of north rail at east end	998.69
Leadvale; top of north rail, main track, at road crossing	985.58
White Pine; 67 feet north of north rail of main track and 150 feet east of mile post 219; bronze tablet in southwest corner of brick dwelling occupied by George Ivy, stamped "1142 M.C."	1,141.802
White Pine; top of north rail, main track, opposite station	1,140.89
Witts; top of north rail, main track, opposite station	1,219.94
Roe; top of north rail, main track, opposite station sign	1,450.21
Morristown; top of north rail of southwest wye, opposite ticket office	1,283.34
Morristown; Hamblen County court-house; bronze tablet, in northeast corner of building, marked "1351 M.C."	1,350.985

MORRISTOWN TO KNOXVILLE.

Alpha; top of main track at road crossing at station	1,306.88
Talbot, 4.9 feet west of west end of depot, 30 feet north of north rail of main track; United States Geological Survey iron bench mark post, bronze cap, stamped "1193 M.C."	1,193.066
Mossy Creek, 90 feet east of station, 116 feet south of north rail of main track; bronze tablet in northeast corner of Mossy Creek Bank building, marked "1118 M.C."	1,117.833
Mossy Creek; top of north rail, center track, opposite station	1,106.21
Newmarket; top of north rail, main track, opposite station	1,050.32
Friends station; top of north rail, main track, at road crossing	986.40
Hodges, 0.63 mile east of; copper bolt in southeast corner of east abutment of culvert (No. A 110.4), 13.5 feet south of north rail of track, stamped "905 M. C."	905.182
Hodges, top of north rail main track at road crossing at station	914.92
Strawberry Plains, top of north rail main track opposite station	889.66
Holston River bridge (No. A 114.5), top of north rail at east end	897.94
Mascot, top of north rail main track opposite station	894.13
Flat Creek bridge (No. A 117.7), copper bolt, 9 feet south of north rail, in abutment, stamped "865 M. C."	864.977
McMillan, top of north rail of main track opposite station	861.48
Caswell, 0.45 mile east of; culvert (No. A 1240), south corner of west abutment, 12 feet south of north rail; copper bolt, stamped "867 M. C."	867.390
Caswell, top of north rail of main track at road crossing	887.95
Knoxville, top of rail under Gay street bridge opposite station	891.31
Knoxville, bronze tablet in northeast corner of Clinch street entrance to custom-house, marked "933 M. C."	933.299

KNOXVILLE TO CLEVELAND.

	Feet.
Knoxville, Cumberland Gap and Louisville Railway, top of east rail under Southern Railway bridge; No. A 132.4	841.38
Bearden, top north rail main track opposite station	882.09
Stinnet, top north rail opposite station sign	939.31
Wright, 0.91 mile east of; culvert (No. A 138.9), 11.3 feet south of north rail in east wall; copper bolt, stamped "940 M. C."	940.382
Wright, top of north rail of main track opposite station	956.38
Ebenezer, top of north rail main track at road crossing at station	902.27
Concord, 24.6 feet west of east end of depot and 28.2 feet south of north rail of main track; bronze tablet in north front of building, marked "820 M.C."	819.915
Boyd, top of north rail main track opposite station	843.49
Warham, top of north rail main track opposite station	823.31
Lenoir City, 291.6 feet north of north rail of main track 154 feet east of depot, in southeast corner of Lenoir City Bank; bronze tablet, marked "799 M.C."	799.258
Lenoir City, top of north rail main track opposite station	784.60
Loudon, 0.58 mile east of; top of north rail main track at west end of Tennessee River bridge (No. A 159.0)	808.61
Loudon; Loudon County court-house, bronze tablet in southwest corner of Grove street entrance, marked "784 M.C."	783.815
Philadelphia, 31.6 feet north of north rail of main track, 2 feet east of depot; United States Geological Survey, iron bench-mark post; bronze cap, marked "860 M.C."	859.780
Philadelphia, top of north rail main track opposite station	859.13
Sweetwater, top north rail main track opposite station	910.85
Sweetwater, 198 feet north of north rail of main track in east front of Sweetwater Bank; bronze tablet, marked "918 M.C."	918.400
Reagan, top north rail main track opposite station sign	963.35

CLEVELAND TO COHUTTA.

Cleveland, top of rail; Georgia division, opposite station	866.2
Blue Springs, 146.7 feet east of west rail of main track, 73.3 feet north of north switch point, in face of ledge of rock; bronze tablet, marked "895 M. C."	895.287
Blue Springs, top of west rail main track opposite station	903.55
Marble switch, top west rail of main track at road crossing, opposite station	908.36
Weatherly, top of west rail at road crossing	843.23
Red Clay (railroad station), top of west rail main track opposite	823.89
Tennessee-Georgia State line, top of west rail of main track at	823.95

GEORGIA.

COHUTTA TO ROME.

Cohutta, 157 feet east of west rail of main track; bronze tablet, in north front of W. A. Williams's brick store, marked "866 M. C."	866.685
Varnell, top of west rail main track, opposite station	808.53
Waring, 24 feet west of west rail of main track and 6.6 feet north of mile post No. H 35; United States Geological Survey iron bench-mark post, bronze cap, marked "795 M. C."	794.946
Dalton, top of west rail of main track opposite station	759.6
Dalton, Whitfield County court-house; bronze tablet, in water table, north side of Cleveland street entrance, marked "774 M. C."	774.336

	Feet.
Phelps, 50 feet west of west rail opposite switch point at south end of side track and near southeast corner of post-office; United States Geological Survey iron bench-mark post, bronze cap, marked "712 M. C."..	712.185
Carbondale, top of west rail main track at road crossing	762.50
Miller, 76.4 feet west of west rail of main track, at northeast corner of L. C. Rooker's store; United States Geological Survey iron bench-mark post, bronze cap stamped "719 M.C".....	718.636
Sugar Valley, top of west rail of main track at road crossing.....	646.96
Oostanaula, top of west rail of main track at road crossing.....	631.59
Oostanaula River, west pedestal block of south abutment of bridge, No. H 61.3) 7.6 feet west of west rail; copper bolt, marked "620 M.C.".....	619.834
Reeves, top of west rail at road crossing.....	637.05
Plainville, top of west rail of main track opposite station.....	677.93
Pinson, 23.3 feet east of west rail and 15.3 feet north of switch point; United States Geological Survey iron bench-mark post, bronze cap, marked "653 M.C.".....	652.547
Shannon, top of west rail, main track, opposite station sign.....	685.24
Harper, top of west rail, main track, at road crossing.....	678.51
North Rome, top of west rail, main track, opposite station.....	630.89
Etowah River, top of west rail, center of 300 foot bridge (No. H 78.9)	622.21
Rome, city post-office; aluminum tablet, set in face of steps to Fourth avenue entrance, marked "614 M.C.".....	613.406
Rome, top of west rail main track opposite station.....	611.15

ROME TO AUSTELL.

Atlanta Junction, top of west rail main track opposite station.....	607.19
Lindale, top of west rail opposite station.....	651.85
Silver Creek, top of west rail of main track at road crossing.....	680.33
Pumpkin Vine Bridge, 360-foot viaduct; (No. H 116.7) top of west rail in center	911.22
Dallas, top of west rail, main track at road crossing	1,003.53
Dallas, Paulding County court-house; bronze tablet, west side of south entrance, marked "1050 M. C.".....	1,050.221
Hiram, top of west rail, main track, at station.....	960.72
Powder Springs, 2.22 miles north of and 0.31 mile north of mile post 128; copper bolt, in rock formation, west side of cut, marked "957 M. C."...	956.826
Powder Springs, top of west rail of main track opposite station.....	913.29
Sweetwater Creek, top of west rail center of 130-foot bridge No. H 133.4.	896.68
Austell, top of west rail of main track opposite station.....	928.11

AUSTELL TO ATLANTA.

Austell, W. E. Shelerton's hotel; bronze tablet in north front of building, 6.7 feet from west corner, marked "930 M. C.".....	929.821
Mableton, top of south rail of main track opposite station.....	981.34
Nickajack, top of south rail of main track at road crossing.....	851.15
Star Buck Field, top of south rail at road crossing.....	812.24
Lenox, 0.42 mile west of; 70 feet west of mile post 142, 8 feet south of south rail of main track; copper bolt in solid rock, marked "804 M. C.".....	804.361
Lenox, top of south rail, main track at road crossing.....	796.57
Oakdale, top of south rail main track opposite station	809.80
Chattahoochee River bridge (No. H 144.5); top of south rail at west end of trestle approach to.....	794.95
Chattahoochee, top of south rail main track opposite station.....	810.14
Chambers, top of west rail at road crossing.....	703.70

	Feet.
Chambers, 0.08 mile south of; copper bolt in north abutment of trestle No. H 86.3, 7 feet west of west rail; marked "697"	696.729
Brice, top of west rail, main track, at road crossing	825.48
Byrd, top of west rail opposite station sign	862.75
Seney, top of west rail, main track, opposite station	829.62
Seney, 0.45 mile south of; 6-foot arch culvert copper bolt in west face wall, 6.3 feet south of center of arch and marked "799 M.C."	798.723
Ravenel station, top of west rail at road crossing	739.12
Long, top of west rail, main track, at road crossing	735.35
E. & W. of A. R. R.; top of north rail under Southern Railway bridge No. H 101.7	745.7
Southern Railway, top of west rail, center of bridge No. H 101.7 over E. & W. of A. R. R.	765.67
Rockmart, 0.13 mile north of; Euharlee Creek bridge; copper bolt in south abutment, 5.7 feet west of west rail, marked "774 M.C."	763.488
Rockmart, top of west rail, main track, opposite station	765.10
Don, top of west rail, main track, at road crossing	912.88
Beatty switch, top of west rail, main track, at road crossing	927.10
Braswell, top of west rail, main track, opposite station	1,056.79
Braswell, 0.54 mile south of; bronze tablet in west wall of tunnel 3 feet from north portal, marked "1088 M.C."	1,087.787
South switch, top of west rail opposite station	1,062.77
McPherson, 79.8 feet west of west rail of main track 30 feet south of road crossing; United States Geological Survey iron bench-mark post set 2 feet from northeast corner of J. E. Butler's house; marked "1015 M.C."	1,014.587
Mouse Creek, top of north rail, main track, opposite station	977.09
Mouse Creek, 33.6 feet north of north rail of main track, 3.1 feet north of south front of station; bronze tablet in west face of building, marked "979 M. C."	978.713
North Athens, top of north rail of main track at road crossing	973.73
Athens, top of north rail of main track opposite station	975.56
Athens, McMinn County court-house; bronze tablet in northwest corner of Jackson street entrance, marked "869 M.C."	868.821
Riceville, 18.2 feet south of north rail of main track, bronze tablet set in north front of depot 2.2 feet from east corner, marked "807 M.C."	807.289
Sanford, top of north rail of main track at road crossing	827.75
Calhoun, top of north rail at road crossing	715.70
Hiawassee River, bridge No. A 200.5, three spans, 391 feet long; bronze tablet in south end of west back wall, marked "706 M.C."	706.396
Charleston, top of north rail main track, opposite station	708.97
Tasso, top of north rail main track at road crossing	800.27
Tasso, 0.2 mile west of; copper bolt in south end of west wall of culvert (No. A 206.9), 9.4 feet south of north rail of main track, stamped "798 M.C."	798.443
Cleveland, Bradley County court-house; bronze tablet in water table north side of Ocoee street entrance, marked "875 M.C."	874.720
Peyton, 16 feet south of south rail of main track and 12 feet west of west side of station; United States Geological Survey iron bench-mark post, bronze cap, marked "855 M.C."	855.003
Ellen N., top south rail, main track, opposite station	894.32
Atlanta, top of rail, center of Union station shed	1,032.59
Atlanta, State Capitol Building; aluminum tablet in north newel post of Washington street entrance, marked "1050 M.C."	1,050.127

GEORGIA.

FANNIN COUNTY.

ELLIJAY QUADRANGLE.

A portion of the following short line of levels was run during the last field season by Mr. Thomas S. Mauldin, jr., levelman, in order to connect the long circuit of levels between Culberson, North Carolina, and Mineral Bluff, Georgia, run in the field season of 1896 and not completed, and accordingly unadjusted in that season. Preliminary elevations on a portion of this circuit are published in the Eighteenth Annual Report, pages 311–317. These elevations are based on the same datum as was used in 1896—namely, a tablet in Boling & Crawford's store, at Blue Ridge, Georgia, marked "1751," the elevation of which is accepted as 1,750.968 feet above mean sea level.

BYNUM, VIA BLAIRSVILLE, TO IVY LOG AND CULBERSON.

	Feet.
Bynum, ¼ mile east of; nail in small stump in fence corner on left of road near house	1,909.66
Bynum, 2 miles east of; nail in root of oak tree on bank right of road on side of hill	1,878.24
Nottely River, fork of trail near top of hill above; nail in root of large oak tree	1,967.17
Nottely River bridge, 600 feet east of; nail in root of oak tree at left edge of road	1,864.32
Blairsville, just west of, at fork of Culberson road; nail in root of oak tree.	1,917.43
Blairsville; bronze tablet in corner of court-house, marked "1926"	1,926.118
Blairsville, ⅜ mile northwest of court-house; nail in root of tree at right of road at stream crossing	1,853.11
Blairsville, 1¼ miles northwest of; nail in root of large oak tree at left of road	1,898.22
Blairsville, 2½ miles northwest of; nail in root of stump near blazed white-oak tree on right side of road	1,827.65
Blairsville, 3¾ miles northwest of; nail in root of oak tree on right side of road opposite fence corner	1,870.79
Blairsville, 4¼ miles northeast of, at top of big hill above Little Ivy Log Creek; nail in root of oak tree on right of road	2,040.07
Little Ivy Log Creek, top of hill just northwest of; nail in root of oak tree on left of road	1,997.30
Napoleon, 400 feet north of large barn at; nail in root of oak tree on bank at right edge of road	1,908.35
Chapman's Ford, ¼ mile east of fork of road to; nail in root of large oak tree immediately in front of church	1,987.37
Blairsville, creek crossing 8¾ miles northwest of; nail in root of white-oak tree on bank to left of road, about 135 yards from stream	1,873.52
Ivy Log Church; iron post in fork of Murphy and Culberson roads, marked "1949"	1,948.600
Ivy Log Church, ¼ mile west of; nail in root of large oak tree on right of road at crossing of trail	1,940.62
Ivy Log Church, 1 mile west of; nail in root of large oak tree at right edge of road in bend just beyond steep rise in road	1,833.49
Nottely River, west end of bridge across; nail in top of stump in fence corner on right of road	1,643.15

	Feet.
Ivy Log, 2¼ miles west of; nail in root of small oak tree 20 feet to left of road and 500 feet from top of hill	1,807.37
Ivy Log, 4 miles northwest of; nail in root of oak tree at intersection of trail on right, just beyond house on top of hill	1,740.44
Ivy Log, 5 miles northwest of; nail in root of large post oak on bank to left of road in bend	1,798.93
Ivy Log, 6 miles northwest of; nail in root of oak tree 20 feet to left of road	1,638.25
Culberson, 1½ miles east of; nail in root of oak tree on left side of road about 120 yards from crossing of creek	1,622.00
Culberson, crossing of creek 1½ miles east of; rock on right of road about 700 feet beyond stream; copper bolt, marked "1617"	1,617.295
Culberson, ½ mile east of; nail in root of white-oak tree on left of road at fork to Murphy	1,786.94
Culberson depot, 1,100 feet north of, and 100 feet from cattle guard; nail in top of small stump about 40 feet to right side of track	1,661.97

CULBERSON TO MINERAL BLUFF, ALONG RAILWAY.

Sweetgum railroad station, crossing at; nail in root of sweet-gum tree about 50 feet from track, on side of road	1,713.71
Sweetgum, lane crossing railroad about 1 mile south of station; nail in trunk of apple tree about 50 feet to left of track	1,742.51
Mineral Bluff, 3 miles north of; ledge of slate rock 250 feet from track on right side of road crossing railroad; copper bolt, marked "1702"	1,702.29
Mineral Bluff; elevation of track at south edge of stream at water tank	1,637.66
Mineral Bluff, 60 feet north of road crossing at; rock 5 feet east of track	1,586.27
Mineral Bluff; marked point on water table at	1,585.27

GEORGIA AND ALABAMA.

FLOYD, CHATTOOGA, AND POLK COUNTIES, GEORGIA, AND CHEROKEE COUNTY, ALABAMA.

ROME AND FORT PAYNE QUADRANGLES.

The result of the extension of precise levels during the last field season from Asheville, via Knoxville and Rome, to Atlanta was a change in the elevation of the assumed datum at Rome, Georgia. That datum was found to be 14.154 feet too high, and in consequence this value must be subtracted from all elevations published in the Eighteenth Annual Report, Part I, under the title "Georgia and Alabama," bottom of page 317 to bottom of page 323. The bench marks established in the course of that leveling are marked, approximately, 14 feet too high, and they may be known by their bearing either no datum letter or the letter "R." Bench marks established since the connection with precise levels have been changed to the datum Anniston, and are stamped with the letter "A," and their marking corresponds with the new precise-level datum. Those elevations, however, which were run in this region during the last season are not published in this annual report, as such work will be continued during the coming field season, and their publication is reserved for the completion of this leveling.

CENTRAL SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. John H. Renshawe, geographer in charge, five leveling parties were engaged at various times during the year in running lines of spirit levels for the control of the topographic work being executed in the various localities.

INDIANA AND ILLINOIS.

LAKE COUNTY, INDIANA, AND COOK AND LAKE COUNTIES, ILLINOIS.

TOLLISTON, EVANSTON, AND HIGHWOOD QUADRANGLES.

The elevations in the following list are based on the Chicago city levels. The initial elevations were derived from two different bench marks of these levels, that for the work in the south of Chicago being on the water table at the northeast corner of One hundred and third street and Indianapolis avenue, South Chicago, the elevation of which was accepted as 586.964 feet above mean sea level, while that for the leveling to the north of Chicago was a square cut in the northeast corner of Lincoln and Foster avenues, Chicago, the elevation of which was accepted as 610.026 feet above mean sea level.

Dependent upon these there was established a bronze tablet in the northeast corner of Todd Opera House block, in South Chicago. This is accepted as the central datum point for these levels, and its elevation is 588.434 feet above mean sea level.

Bench marks set in the progress of this work were marked "CHGO," in addition to the figures of elevation.

The leveling was done under the direction of Mr. R. C. McKinney, topographer, by Mr. E. S. Smith, levelman.

	Feet.
T. 35 N., R. 9 W., S. 1; road crossing Chicago and Grand Trunk Railroad, on east line of section	631
T. 35 N., R. 9 W., S. 2; Griffith; Chicago and Grand Trunk Railroad, top of rail	637.26
T. 35 N., R. 9 W., S. 2; Griffith; frame schoolhouse, south edge of town, brick foundation at northeast corner of; bronze tablet marked "CHGO 630"	630.186
T. 35 N., R. 9 W., S. 4; southwest corner of; crossing Michigan Central Railroad at Hartsdale	626
T. 35 N., R. 8 W., S. 4; center of; door sill of schoolhouse	634.58
T. 35 N., R. 8 W., S. 4; near center of; large stone church, front face northwest corner of; bronze tablet in stonework 20 inches from ground, marked "CHGO 640"	640.200
T. 35 N., R. 7 W., S. 5; in northwest ¼ of; brick schoolhouse, south of entrance at east side of, top course of stone in foundation; bronze tablet marked "CHGO 633"	633.051
T. 36 N., R. 9 W., S. 14; Calumet; New York Central and St. Louis Railroad, top of rail in front of depot	600
T. 36 N., R. 9 W., S. 4; near center of crossing of Michigan Central Railroad	594
T. 36 N., R. 9 W., S. 9; crossing of wagon road with New York Central and St. Louis Railroad, just north of Hessville, top of rail	610

	Feet.
T. 36 N., R. 9 W., S. 9; road crossing at Hessville (ground)	620
T. 36 N., R. 9 W., S. 16; road crossing Little Calumet River, water level	589
T. 36 N., R. 9 W., S. 21; Highlands; Chicago and Erie Railroad, top of rail east end depot	619.24
T. 36 N., R. 9 W., S. 21; Highlands; public school building, southwest corner of front projection, south side of top course of stone foundation; bronze tablet, marked "CHGO 618"	618.149
T. 36 N., R. 8 W., S. 24; crossing Michigan Central and Pittsburgh and Fort Wayne railroads, top of rail	622.33
T. 36 N., R. 8 W., S. 8; Tolliston, frame schoolhouse, northwest corner of, top course stone foundation; bronze tablet, marked "CHGO 600"	599.905
T. 36 N., R. 8 W., S. 12; Ætna, gravel road at powder works	608
T. 36 N., R. 8 W., S. 31; Clark, water tank Pittsburgh, Fort Wayne and Chicago Railroad, 300 feet southeast of depot, masonry foundation of northwest corner of; copper bolt, marked "CHGO 591"	591.144
South Chicago; stone water table, northeast corner Todd Opera House block, southwest corner Chicago avenue and Forsyth street; bronze tablet, marked "CHGO 588"	588.434
T. 36 N., R. 7 W., S. 6; Miller schoolhouse, brick water table, southwest corner of	616.51
T. 36 N., R. 7 W., S. 32; Hobart, wagon bridge over Deep River; top of stone southwest corner of west abutment; copper bolt marked "CHGO 607"	606.904
Chicago; southwest corner Clark street and Pratt avenue, northeast corner two-story brick building, base of iron column	603.456
Evanston; Evanston city hall, north side of east entrance of; bronze tablet in face of stonework 18 inches above sill, marked "CHGO 601"	601.486
Evanston; Chicago and Northwestern Railroad crossing at Greenwood street, top of rail	599.76
T. 41 N., R. 13 E., S. 14; southwest corner of (ground)	605
Niles Center; near southeast corner of St. Peter's Church; projecting buttress front face of stone water table; bronze tablet marked "CHGO 623".	622.676
T. 41 N., R. 13 E., S. 16; southwest corner of (ground)	631
Morton station; iron wagon-road bridge over Des Plaines River, top of stone abutment	619.05
T. 41 N., R. 12 E., S. 23; in northeast ¼ of, corner Milwaukee avenue and Dempster street, corner of porch west side of saloon	662
T. 41 N., R. 12 E., S. 14; southwest corner of (ground)	643
T. 41 N., R. 12 E., S. 20; southwest corner of (ground)	650
T. 41 N., R. 11 E., S. 16; in northeast ¼ of; cheese factory at cross roads, south face of brickwork near foundation at southeast corner of; bronze tablet marked "CHGO 715"	715.035
T. 42 N., R. 12 E.; road crossing on half section line between sections 15 and 16; ½ mile south of Shermerville; iron post marked "CHGO 650".	650.196
Winetka; corner Linden and Willow streets, hydrant top	646.2
Winetka; Chicago Northwestern Railroad viaduct over Willow street, northwest corner north abutment	638.7
Winetka; old town hall, 30 feet north of northeast corner of; iron post marked "CHGO 651"	650.561
Grass Point; St. Joseph's church, hydrant plug at southwest corner of	634.478
Des Plaines; town hall, stone foundation east side of; bronze tablet marked "CHGO 642"	642.239
T. 42 N., R. 11 E., S. 29; in southwest ¼ of; wagon crossing Chicago Northwestern Railroad, top of rail	694.38
T. 42 N., R. 11 E., S. 29; Arlington Heights; High School building, front face of stone water table at southwest corner of front projection; bronze tablet marked "CHGO 666"	666.236

	Feet.
T. 42 N., R. 11 E., S. 5; southwest corner of (ground)	700
T. 43 N., R. 12 E., S. 17; in southwest ¼ of; water subway under Chicago, Milwaukee and St. Paul Railroad, at road crossing, east face at northeast corner of stonework; bronze tablet marked "CHGO 671"	671.075
T. 43 N., R. 11 E., S. 20; southwest corner of (ground)	708
T. 43 N., R. 11 E.; Prairie View; wagon road crossing Wisconsin Central Railroad, top of rail	690.97
T. 43 N., R. 11 E., S. 15; half-day school building, front face of northwest corner of foundation; bronze tablet marked "CHGO 669"	668.777
T. 43 N., R. 11 E., S. 14; bridge over Des Plaines River (floor)	648.2

ILLINOIS AND INDIANA.

VERMILION COUNTY, ILLINOIS, AND WARREN AND VERMILION COUNTIES, INDIANA.

DANVILLE QUADRANGLE.

The elevations in the following list are based on the levels of the Chicago and Eastern Illinois Railroad, in front of depot at Danville Junction. Elevation 613.5 feet above mean sea level. Dependent on this, the central datum tablet, placed in the post-office building, is accepted as being 602.526 feet above mean sea level and is marked "DNVL 603."

Bench marks set during current year are marked "DNVL" in addition to figures of elevation.

The leveling was done by Mr. John L. McCalman, level man, under the direction of Mr. R. C. McKinney, topographer.

	Feet.
Danville Junction; railroad crossing front of depot; top of rail	613.5
Danville; passenger depot Chicago and Eastern Illinois Railroad; top of rail in front of	598.2
Danville; passenger depot Wabash Railroad; top of rail in front of	598.8
Danville; passenger depot Chicago, Cleveland, Cincinnati and St. Louis Railroad; top of rail in front of	605.3
Danville; post-office, opposite main entrance; top of curb at mail box	600.62
Danville; post-office building, east face of north balustrade, 1¼ feet above sidewalk; bronze tablet marked "DNVL 603"	602.526
Danville; courthouse, just south of step to west entrance, second course above sidewalk; bronze tablet marked "DNVL 604"	603.796
T. 18 N., R. 11 W., S. 5; southwest corner of, Westville; iron post marked "DNVL 672"	672.09
T. 19 N., R. 11 W., S. 12; near northeast corner of; nail in telephone pole north side of wagon road	651.6
T. 19 N., R. 11 W., S. 19; in northeast ¼ of, Tilton; nail in telephone pole at double brick store	645.4
T. 19 N., R. 11 W., S. 14; southeast corner of; nail in corner post fence at road crossing	661.5
T. 19 N., R. 11 W., S. 24; ¼ corner east side of; nail in gatepost	613.1
T. 19 N., R. 11 W., S. 25; ¼ corner south side of; nail in telephone pole at road crossing	660.5
T. 19 N., R. 11 W., S. 16; in southeast ¼ of, junction Backbone and Rileysburg wagon roads; nail in telephone pole	591.2
T. 19 N., R. 11 W., S. 27; in north half of, junction Grape Creek and Perrysville wagon roads; nail in telegraph pole	528.8

	Feet.
T. 19 N., R. 11 W., S. 6; north side of, Illinois-Indiana State line; nail in telephone pole	648.5
T. 19 N., R. 11 W., S. 31; southeast corner of; nail in telephone pole at road crossing near Kellyville Coal Company's store	663.8
T. 19 N., R. 11 W., S. 11; northeast corner of; nail in telephone pole	648.8
T. 19 N., R. 11 W., S. 27; in north half of; floor of bridge over Vermilion River on Grape Creek road	533.5
T. 19 N., R. 11 W., S. 34; in north half of, Grape Creek; nail in telephone pole west side of wagon road at crossing of Chicago and Eastern Illinois Railroad	540.1
T. 19 N., R. 12 W., S. 34; near center of, Catlin; iron post marked "DNVL 658"	658.423
T. 19 N., R. 12 W., S. 12; at crossroads, near northeast corner of, Batestown	636.4
T. 20 N., R. 10 W., S. 31; northeast corner of; nail in telephone pole	655
T. 20 N., R. 10 W., S. 18; ¼ corner east side of, on State line; iron post marked "DNVL 720"	719.944
T. 20 N., R. 11 W., S. 11; northeast corner of; rock at section corner	699.3
T. 20 N., R. 11 W., S. 9; north side of; crossing of Chicago and Eastern Illinois Railroad; nail in telegraph pole	678.4
T. 20 N., R. 11 W., S. 17; ¼ corner north side of; iron post marked "DNVL 655"	655.11
T. 20 N., R. 12 W., S. 12; center of; nail in large red oak at road crossing	654.93
T. 20 N., R. 12 W., S. 14; northwest corner of, Snyder; nail in porch post of store at crossroads	691.3
T. 20 N., R. 12 W., S. 35; southwest corner of; iron post marked "DNVL 649"	649.06
T. 19 N., R. 11 W., S. 6; southeast corner of; nail in telephone pole at road crossing	648.4
T. 19 N., R. 11 W., S. 6; northeast corner of; nail in telephone pole	643.8

IOWA AND WISCONSIN.

DUBUQUE AND CLAYTON COUNTIES, IOWA, AND IOWA AND GRANT COUNTIES, WISCONSIN.

LANCASTER QUADRANGLE.

The elevations in the following list depend on the Mississippi River Commission bench mark at Dubuque, which is the same as was used for the Maquoketa and Anamosa quadrangles, surveyed in the season of 1896. The bench mark is in the northeast corner of the custom-house, a copper bolt marked "U.S.P.B.M.," the elevation of which is 643.481 above mean sea level. (See Eighteenth Annual Report, Part I, p. 326.)

All bench marks left during the current season were marked "DBQ" in addition to the figures of elevation.

The leveling was done by Mr. C. E. Hewitt, level man, under the direction of Mr. Charles E. Cooke, topographer.

	Feet.
T. 89 N., R. 1 E., S. 12; wagon road bridge over Chicago and Great Western Railroad; spike in pile	669.2
T. 89 N., R. 1 E., S. 11; bridge at French crossing; × cut in north end of west abutment	700.1

	Feet.
T. 89 N., R. 1 E., S. 16; near southeast corner of, wagon bridge over South Fork Maquoketa River, east end of south abutment; bronze tablet marked "DBQ 732"	732.240
T. 89 N., R. 1 W., S. 16; southeast ¼ of; × cut in stone at southeast corner of Bankstone churchyard	1,205.51
T. 89 N., R. 1 W., S. 16; northeast ¼ of, ¼ mile south of Bankstone, southwest corner of O'Connor's orchard; iron post marked "DBQ 1193"	1,192.969
T. 90 N., R. 1 W., S. 20; near center of; × cut in stone well curb southwest corner of crossroads	1,156.76
T. 90 N., R. 1 W., S. 17; on north line of, southeast corner of O. W. Burn's field; iron post marked "DBQ 1159"	1,158.530
T. 90 N., R. 1 E., S. 4; south side of; bronze tablet set in ledge of rock marked "DBQ 1049"	1,048.531
T. 90 N., R. 1 E., S. 3; near center of, 600 feet east of Kanoble's corner; × cut in stone south of road	1,039.35
T. 90 N., R. 2 E., S. 34; Sageville bridge over Maquoketa River, stone on west end of north abutment; bronze tablet marked "DBQ 621"	621.276
T. 91 N., R. 1 W., S. 32; north side of, junction of John Richmond's road with main wagon road; iron post marked "DBQ 1181"	1,181.121
T. 2 N., R. 1 W., S. 27; northwest corner of; Georgetown town hall, northwest corner of; bronze tablet in foundation stone marked "DBQ 994"	994.392
T. 2 N., R. 1 W., S. 10; in northwest ¼ of, stone in southwest corner of churchyard	950.3
T. 2 N., R. 1 W., S. 21; ¼ corner north side of, corner of Val Wicterholt's field; iron post marked "DBQ 913"	912.504
T. 2 N., R. 1 W., S. 10; northwest corner of, rock at road crossing	926.6
T. 2 N., R. 1 W., S. 34; southwest corner of; stone in southeast corner of schoolhouse yard	935.8
T. 2 N., R. 1 W., S. 34; northwest corner of, nail in post of bridge	967.7
T. 2 N., R. 2 W., S. 22; in southwest ¼ of; Dickeyville, southwest corner of hotel; bronze tablet in foundation stone marked "DBQ 955"	955.288
T. 3 N., R. 1 W., S. 33; southeast ¼ of; × in north abutment of bridge over Block House Creek	848.83
T. 3 N., R. 1 W., S. 22; northwest corner of; × in stone west end of abutment of bridge over Round Tree Branch, south edge Platteville	868.93
T. 3 N., R. 1 W., S. 15; × mark in stone, west entrance of park at Platteville	993.97
T. 3 N., R. 1 W., S. 15; Platteville, northwest corner city hall; bronze tablet in foundation of stone marked "DBQ 992"	991.935
T. 3 N., R. 2 W., S. 12; ¼ corner west side of; iron post marked "DBQ 1014".	1,013.527
T. 3 N., R. 3 W., S. 26; in southwest ¼ of; iron post at road crossing marked "DBQ 986"	985.950
T. 3 N., R. 3 W., S. 34; × in stone south side of street in Potosi	786.38
T. 3 N., R. 4 W., S. 10; in southeast ¼ of; north side of wagon road; iron post marked "DBQ 980"	980.334
T. 3 N., R. 4 W., S. 4; in southwest ¼ of; × in stone step of schoolhouse No. 5	680.84
T. 3 N., R. 5 W., S. 15; near northwest corner of; iron post marked "DBQ 967"	967.253
T. 4 N., R. 1 W., S. 5; southwest corner of; × in stone, east side of wagon road	955.53
T. 4 N., R. 1 W., S. 8; in southwest ¼ of; crossroads at Bailey's Creamery; iron post marked "DBQ 1090"	1,089.540
T. 4 N., R. 2 W., S. 33; in northeast ¼ of; × marked in stone, south and west abutment of bridge over Big Platte River	712.30

	Feet.
T. 4 N., R. 2 W., S. 33; near center of; south end west abutment of bridge over Big Platte River at Ellenboro; bronze tablet marked "DBQ 712".	712.335
T. 4 N., R. 3 W., S. 14; near northwest corner of; west end south abutment of bridge over Pigeon Creek; bronze tablet marked "DBQ 946"	945.576
T. 4 N., R. 3 W., S. 3; Lancaster, east entrance to court-house; × cut in north end of stone step	1,085.83
T. 4 N., R. 4 W., S. 30; Beetown post-office building; bronze tablet in northwest corner of foundation marked "DBQ 793"	792.946
T. 4 N., R. 5 W., S. 14; near ¼ corner, south side of; in north end of east abutment of bridge; bronze tablet marked "DBQ 873"	873.170
T. 5 N., R. 1 W., S. 18; bridge over Big Platte River at Annaton; bronze tablet in stone, east end north abutment of, marked "DBQ 859"	858.774
T. 5 N., R. 2 W., S. 19; in southwest ¼ of; Liberty Ridge Church, nail in stepping block in front of	1,123.3
T. 5 N., R. 2 W., S. 9; in northwest ¼ of; stone at railroad crossing northeast of Stetzer depot	1,176
T. 5 N., R. 2 W., S. —; Stetzer, southeast corner of block opposite railroad depot; bronze tablet in foundation of store marked "DBQ 1166"	1,166.443
T. 5 N., R. 3 W., S. 36; in northwest ¼ of; crossing of north and south wagon road with railroad; end of right of way fence; iron post marked "DBQ 1133"	1,133.373
T. 5 N., R. 4 W., S. 16; near ¼ corner west side of; iron post marked "DBQ 1092"	1,092.150
T. 5 N., R. 5 W., S. 25; × in stone abutment bridge	906.53
T. 5 N., R. 5 W., S. 26; east side of foundation of building opposite Bloomington Hotel; bronze tablet marked "DBQ 901"	901.483
T. 6 N., R. 1 W., S. 10; near center of road crossing ¼ mile east of Preston; iron post marked "DBQ 1118"	1,118.050
T. 6 N., R. 2 W., S. 21; Lancaster Junction, 50 feet south of switch; iron post marked "DBQ 1166"	1,166.014
T. 6 N., R. 3 W., S. 29; Mount Ida Cheese Factory; bronze tablet in east end of foundation marked "DBQ 1200"	1,200.029
T. 6 N., R. 3 W., S. 20; southwest corner of; × in stone at road crossing	1,214.97
T. 6 N., R. 4 W., S. 28; near center of; Mount Hope post-office building; bronze tablet in east side of foundation marked "DBQ 1076"	1,076.329
T. 6 N., R. 5 W., S. 26; ¼ corner south side of; iron post marked "DBQ 1137".	1,136.517
T. 7 N., R. 2 W., S. 25; northwest ¼ of; 50 feet southeast of bridge at east of edge of Fairplay; iron post marked "DBQ 862"	861.872

MINNESOTA AND WISCONSIN.

CHISAGO AND WASHINGTON COUNTIES, MINNESOTA, AND POLK COUNTY, WISCONSIN.

ST. CROIX FALLS QUADRANGLE.

The elevations in the following list are based on the permanent bench mark of the United States Engineers located in the village of Wyoming, Chisago County, Minnesota, on the north side of Fourth street, 1,100 feet north of the St. Paul and Duluth Railroad depot. The bench mark is an iron pipe set in the ground and surmounted by an iron cap, the elevation of which is 890.563 feet above mean sea level.

All bench marks established were referred to the Geological Survey

bronze tablet set near Taylors Falls schoolhouse in the progress of this work, and all are marked "TF" in addition to the figures of elevation.

The leveling was done by Mr. S. P. Connor, level man, under the direction of Mr. Paul Holman.

	Feet.
Chisago City; railroad depot, copper nail in southeast corner of platform.	921.37
Center City; railroad depot, copper nail in southwest corner of platform..	906.37
Shafer; railroad depot, top of rail in front of	940.2
T. 34 N., R. 19 W., S. 32; southwest ¼ of; Shafer, 100 feet west of railroad depot; iron post marked "TF 941"	941.412
Franconia; railroad depot, top of rail in front of	909.3
Taylors Falls; railroad depot, top of platform opposite east door	798.4
Taylors Falls; railroad depot, top of rail in front of	794.7
Taylors Falls; Hotel Cocheco, front wall northwest corner of; bronze tablet marked "TF 757"	757.164
Taylors Falls; brick schoolhouse 100 feet north of; bronze tablet in trap rock marked "TF 890"	890.479
Taylors Falls; 100 feet south of Taylors Falls Bridge tollhouse; bronze tablet in top of stone marked "TF 713"	713.404
Taylors Falls; at boat landing; bronze tablet in flat trap rock marked "TF 703"	703.261
Taylors Falls; southwest corner of street north of Inter-State Park office; bronze tablet in stone marked "TF 743"	743.179
T. 35 N., R. 19 W., S. 34; in east ½ of; in front of Daubney's house; iron post marked "TF 773"	773.101
St. Croix Falls; Chicago, St. Paul and Sault Ste. Marie Railroad depot; top of rail in front of	921.1
T. 34 N., R. 18 W., S. 30; in northwest ¼ of; St. Croix Falls, southeast corner Kentucky and Washington streets; iron post marked "TF 812	812.273
T. 35 N., R. 18 W., S. 35; southwest corner of; iron post marked "TF 1242".	1,241.917
T. 34 N., R. 18 W., S. 30; southwest ¼ of; on rocky bluff across river from Taylors Falls boat landing, between St. Croix River and Thaxter Lake; bronze tablet marked "TF 848"	847.988
T. 34 N., R. 18 W., S. 20; southwest corner of; top of rock at section corner	1,015.5
T. 34 N., R. 18 W., S. 1; northwest corner of; rock at section corner	1,229.5
T. 34 N., R. 18 W., S. 1; northeast corner of; iron post marked "TF 1232"..	1,232.277
Osceola; railroad depot; top rail in front of	809
T. 33 N., R. 19 W., S. 27; northwest ¼ of; Osceola, county jail building, southeast corner of; bronze tablet marked "TF 810"	810.424
T. 33 N., R. 19 W., S. 25; ¼ corner east side of	907
Dresser Junction; railroad depot; top of rail in front of	953.6
T. 33 N., R. 18 W., S. 7; near southeast corner of; Dresser Junction post-office, 75 feet west of; iron post marked "TF 969"	969.347
T. 33 N., R. 18 W., S. 3; southwest corner of	1,147
T. 33 N., R. 18 W., S. 36; northeast corner of (ground)	1,008
T. 33 N., R. 18 W., S. 13; southeast corner of (ground)	1,069
T. 33 N., R. 18 W., S. 12; southeast corner of (ground)	1,199
T. 33 N., R. 18 W., S. 9; southeast corner of; on box culvert at road crossing	1,126
Nye; railroad depot, top of rail in front of	967.1
T. 33 N., R. 18 W., S. 27; southwest ¼ of; Nye; iron post marked "TF 966".	965.891
T. 33 N., R. 17 W., S. 7; ¼ corner north side of; iron post, marked "TF 1114".	1,114.217
T. 32 N., R. 19 W., S. 15; southeast ¼ of; Farmington, in front of town hall; iron post marked "TF 1038"	1,037.98

	Feet.
T. 32 N., R. 19 W., S. 13; northwest corner of; cross mark on stone at road crossing	1,050.29
T. 32 N., R. 18 W., S. 18; northwest corner of; cross mark on stone at road crossing	1,057.63
T. 32 N., R. 18 W., S. 17; northwest corner of (ground)	1,072
T. 32 N., R. 18 W., S. 16; northwest corner of (ground)	1,052
T. 32 N., R. 18 W., S. 16; ¼ corner east side of (ground)	940
T. 32 N., R. 18 W., S. 15; southwest ¼ of; Alden post-office; iron post, marked "TF 953"	953.488
T. 32 N., R. 18 W., S. 15; northeast corner of (ground)	958
T. 32 N., R. 18 W., S. 10; northeast corner of; rock in road	983.2
T. 32 N., R. 18 W., S. 3; northeast corner of; nail in top of box culvert	981.5
T. 32 N., R. 17 W., S. 6; northwest corner of; iron post, marked "TF 1019"	1,019.054

OKLAHOMA.

The elevations in the following list are based on a permanent bench mark of the United States Geological Survey at Purcell, Indian Territory, marked by a copper plate in the southwest corner of the United States court-house, stamped "1092," the elevation of which is 1,091.691 feet above mean sea level. The initial height on which the leveling in this district rests is the permanent bench mark established by the United States Coast and Geodetic Survey at Fort Smith, Arkansas, consisting of a copper bolt in the west wall of the United States jail, the height of which is accepted as 446.29 feet above mean sea level. The levels in this district extend from the east boundary of Oklahoma along the line of the Choctaw, Oklahoma and Gulf Railroad to El Reno, thence southward along the Chicago and Rock Island Railroad to the south line of the Territory; also from Oklahoma City southward along the Atchison, Topeka and Santa Fe Railroad to the south line of the Territory.

The leveling was done by an independent party in charge of Mr. Robert Coe, levelman, under the general direction of Mr. John H. Renshawe, geographer.

All bench marks left during the progress of this work were marked "OKLA" in addition to the figures of elevation.

GULF, COLORADO AND SANTA FE RAILROAD.

	Feet.
Wayne, Indian Territory; railroad depot, top of rail in front of	1,100
Milepost 511; railroad spike in second telegraph pole north of	1,085.5
Milepost 512; railroad spike in telegraph pole	1,078.8
Milepost 513; railroad spike in telegraph pole	1,094
Milepost 514; railroad spike in telegraph pole	1,046.4
Milepost 515; railroad spike in telegraph pole 200 feet west of railroad track	1,016.6
Milepost 516; railroad spike in telegraph pole	1,019.4
Purcell, Indian Territory; new railroad depot, top of rail in front of	1,026.9
Purcell, Indian Territory; United States court-house in course of stone above basement; second stone from southwest corner; middle of south face; copper plate marked "OKLA 1092"	1,091.691

ATCHISON, TOPEKA AND SANTA FE RAILROAD.

	Feet.
Milepost 416; railroad spike in telegraph pole	1,034
Milepost 415; railroad spike in telegraph pole	1,037.7
Milepost 414; railroad spike in telegraph pole	1,049.7
Milepost 413; railroad spike in telegraph pole	1,051.4
Canadian River; railroad bridge, south end of trestle, approach to	1,060.7
Canadian River; railroad bridge crossing, east side of south pier, northeast rivet on bridge plate	1,057.5
Canadian River; under railroad bridge, surface of water	1,042
Walker, Oklahoma; end of switch south of	1,060.2
Milepost 411; railroad spike in telegraph pole	1,058.5
Milepost 410; railroad spike in telegraph pole	1,099.1
Milepost 409; railroad spike in telegraph pole	1,132.1
Noble, Oklahoma; railroad depot, top of rail in front of	1,172.6
Milepost 408; railroad spike in telegraph pole	1,171.2
Milepost 407; railroad spike in first telegraph pole north of	1,133.9
Milepost 406; railroad spike in telegraph pole	1,156.5
Milepost 405; railroad spike in telegraph pole	1,162.4
Milepost 404; railroad spike in telegraph pole	1,137.2
Milepost 403; railroad spike in telegraph pole	1,152.3
Norman, Oklahoma; railroad depot, top of rail in front of	1,164.5
Norman, Oklahoma; State bank, northeast corner, left side of entrance, southeast face of, second stone above sidewalk; copper plate marked "OKLA 1170"	1,170.200
Milepost 401; railroad spike in telegraph pole	1,185.6
Milepost 400; railroad spike in telegraph pole	1,181.9
Milepost 399; railroad spike in telegraph pole	1,173.6
Milepost 398; railroad spike in second telegraph pole north of	1,154.9
Milepost 397; railroad spike in telegraph pole	1,166.6
Milepost 396; railroad spike in telegraph pole	1,173.2
Milepost 395; railroad spike in telegraph pole	1,205
Milepost 394; railroad spike in telegraph pole	1,229.5
Moore, Oklahoma; railroad depot, top of rail in front of	1,242
Milepost 393; railroad spike in telegraph pole	1,249.6
Milepost 392; railroad spike in telegraph pole	1,283.1
Milepost 391; railroad spike in telegraph pole	1,308
Milepost 390; railroad spike in first telegraph pole south of	1,280.3
Milepost 389; railroad spike in telegraph pole	1,281.3
Milepost 388; railroad spike in telegraph pole	1,258
Milepost 387; railroad spike in telegraph pole	1,229.1
Milepost 386; railroad spike in telegraph pole	1,197
North Canadian River; center of bridge crossing	1,183.5
North Canadian River; water level under railroad bridge	1,164
Oklahoma City Railroad depot; top of rail in front of	1,194.6

CHOCTAW, OKLAHOMA AND GULF RAILROAD.

Oklahoma City, Oklahoma; intersection Atchison, Topeka and Santa Fe Railroad with Choctaw, Oklahoma and Gulf Railroad, northeast of, 60 feet east of Atchison, Topeka and Santa Fe Railroad tracks and 35 feet north of Choctaw, Oklahoma and Gulf Railroad tracks; iron post marked "OKLA 1197"	1,196.867
Oklahoma City, Oklahoma; crossing Atchison, Topeka and Santa Fe Railroad and Choctaw, Oklahoma and Gulf Railroad; top of rail	1,197.3
Milepost 33; railroad spike in first telegraph pole west of	1,182.7
Milepost 34; railroad spike in first telegraph pole east of	1,164.9

	Feet.
Milepost 35; railroad spike in telegraph pole	1,160.8
Milepost 36; railroad spike in telegraph pole	1,159.4
Milepost 37; railroad spike in telegraph pole	1,164
Milepost 38; railroad spike in first telegraph pole east of	1,176.3
Milepost 39; railroad spike in fifth telegraph pole east of	1,222.3
Milepost 40; railroad spike in telegraph pole	1,219.5
Milepost 41; railroad spike in telegraph pole	1,243.4
Milepost 42; railroad spike in second telegraph pole east of	1,223.7
Milepost 43; railroad spike in telegraph pole	1,172.7
Milepost 44; railroad spike in telegraph pole	1,125.2
Milepost 45; railroad spike in telegraph pole	1,106.7
Choctaw City, Oklahoma; railroad depot, top of rail in front of	1,104.7
Milepost 46; railroad spike in telegraph pole	1,100.7
Milepost 47; railroad spike in telegraph pole	1,095.3
Milepost 48; railroad spike in telegraph pole	1,095.9
Milepost 49; railroad spike in telegraph pole	1,076.9
Milepost 50; railroad spike in telegraph pole	1,076.2
Milepost 51; railroad spike in first telegraph pole west of	1,067.2
Sweeney, Oklahoma; end of switch west of	1,069
Milepost 52; railroad spike in telegraph pole	1,066.1
Milepost 53; railroad spike in second telegraph pole west of	1,062.4
Milepost 54; railroad spike, in oak 24 inches in diameter, 20 inches above ground, 130 feet south of railroad track	1,055.7
Milepost 55; railroad spike in first telegraph pole east of	1,057.7
Milepost 56; railroad spike in telegraph pole	1,064.1
McLoud, Oklahoma; railroad depot, top of rail in front of	1,052.1
Milepost 57; railroad spike in telegraph pole	1,051.5
Milepost 58; railroad spike in telegraph pole	1,065.7
Milepost 59; railroad spike in telegraph pole	1,047.8
Milepost 60; railroad spike in telegraph pole	1,039.4
Milepost 61; railroad spike in telegraph pole	1,040.9
Dale, Oklahoma; railroad depot, top of rail in front of	1,036.4
Milepost 62; railroad spike in first telegraph pole east of	1,021
Canadian River, north fork of; railroad crossing, top of bridge	1,019.4
Canadian River, north fork of; water level	1,002
Milepost 63; railroad spike in first telegraph pole east of	1,023.3
Milepost 64; railroad spike in second telegraph pole east of	1,009.9
Milepost 65; railroad spike in telegraph pole	1,022.9
Milepost 66; 32 feet south of railroad track; iron post marked "OKLA 1018"	1,017.98
Milepost 30; railroad spike in telegraph pole	1,197.7
Milepost 29; railroad spike in telegraph pole	1,206
Milepost 28; railroad spike in telegraph pole	1,205.6
Milepost 27; railroad spike in telegraph pole	1,209.8
Milepost 26; 24 feet south of railroad track; iron post marked "OKLA 1211"	1,211.078
Milepost 25; railroad spike in telegraph pole	1,217.9
Milepost 24; railroad spike in telegraph pole	1,227.9
Milepost 23; railroad spike in telegraph pole	1,233.8
Milepost 22; railroad spike in telegraph pole	1,238
Milepost 21; railroad spike in telegraph pole	1,240
Milepost 20; 24 feet south of railroad track; iron post marked "OKLA 1281"	1,280.809
Milepost 19; railroad spike in telegraph pole	1,283.7
Milepost 18; railroad spike in telegraph pole	1,293.4
Yukon, Oklahoma; railroad depot, top of rail in front of	1,295.1

	Feet.
Milepost 17; railroad spike in telegraph pole	1,296.9
Milepost 16; railroad spike in telegraph pole	1,282.5
Milepost 15; railroad spike in telegraph pole	1,275
Milepost 14; 25 feet south of railroad track; iron post marked "OKLA 1279"	1,279.188
Milepost 13; railroad spike in telegraph pole	1,300
Milepost 12; railroad spike in first telegraph pole east of	1,283.9
Milepost 11; railroad spike in telegraph pole	1,287.8
Milepost 10; railroad spike in telegraph pole	1,292
Milepost 9; railroad spike in telegraph pole	1,305.9
Milepost 8; railroad spike in first telegraph pole west of, 27 feet south of railroad track; iron post marked "OKLA 1306"	1,306.254
Milepost 7; railroad spike in telegraph pole	1,306.8
Milepost 6; railroad spike in telegraph pole	1,315.1
Milepost 5; railroad spike in first telegraph pole west of	1,320.5
Milepost 2; railroad spike in telegraph pole	1,323.3
Fort Reno; railroad depot, top of rail in front of	1,341.4
Fort Reno, Oklahoma; parade ground, foot of flagstaff; iron post marked "OKLA 1392"	1,392.091

CHICAGO, ROCK ISLAND AND PACIFIC RAILROAD.

El Reno, Oklahoma; First National Bank, northeast face, second stone above sidewalk, right hand side of entrance; copper plate marked "OKLA 1357"	1,357.342
El Reno Junction; crossing Choctaw, Oklahoma and Gulf Railroad with Chicago, Rock Island and Pacific Railroad; 54 feet south of Choctaw, Oklahoma and Gulf Railroad; 44 feet east of the Chicago, Rock Island and Pacific Railroad; iron post marked "OKLA 1327"	1,327.308
Milepost 404; railroad spike in telegraph pole	1,367.5
Milepost 405; railroad spike in telegraph pole	1,375.9
Milepost 406; railroad spike in third telegraph pole south of	1,360.1
Milepost 407; railroad spike in telegraph pole	1,349.5
Milepost 408; 38 feet west of railroad track; iron post marked "OKLA 1387"	1,386.700
Milepost 409; railroad spike in first telegraph pole south of	1,380.7
Milepost 410; railroad spike in telegraph pole	1,366.3
Milepost 411; railroad spike in telegraph pole	1,350.1
Milepost 412; railroad spike in telegraph pole	1,333.7
Union City, Oklahoma; railroad depot, top of rail in front of	1,329.6
Milepost 413; railroad spike in fifth telegraph pole south of	1,297.2
Milepost 414; third telegraph pole north of; 34 feet west of railroad; iron post marked "OKLA 1267"	1,266.511
Canadian River; railroad bridge, top of rail, north end of trestle	1,265
Canadian River; bed of	1,245
Milepost 415; bolt in telegraph pole	1,253.4
Milepost 416; railroad spike in telegraph pole	1,273.3
Milepost 417; railroad spike in telegraph pole	1,293.6
Minco, Indian Territory; railroad depot, top of rail in front of	1,293.6

NEBRASKA AND COLORADO.

CHEYENNE, DEUEL, M'PHERSON, AND KEITH COUNTIES, NEBRASKA, AND SEDGWICK COUNTY, COLORADO.

SIDNEY, CHAPPELL, AND OGALALLA QUADRANGLES.

The elevations in the following list depend on the bench mark established in the season of 1896 at Sidney, consisting of a copper bolt set in the astronomic monument in the parade grounds of old Fort Sidney,

marked "U.S.G.S. 4086 feet B.M." (See Eighteenth Annual Report, Part I, p. 338.)

All bench marks set during the current season were marked "SIDNEY," in addition to the figures of elevation.

The leveling was done by Mr. Ross C. Cornish, levelman, under the general direction of Mr. H. B. Blair, topographer.

	Feet.
T. 15 N., R. 47 W., S. 28; southeast corner of; iron post marked "SIDNEY 3960"	3,960.192
T. 15 N., R. 47 W., S. 27; southeast corner of	3,944.3
T. 15 N., R. 47 W., S. 26; southeast corner of	3,965.7
T. 15 N., R. 47 W., S. 26; southeast corner of; iron post marked "SIDNEY 3913"	3,913.356
T. 15 N., R. 46 W., S. 30; southeast corner of	3,924.1
T. 15 N., R. 46 W., S. 29; southeast corner of	3,921.3
T. 14 N., R. 48 W., S. 28; west side of; on main line Union Pacific Railroad	3,987.3
T. 14 N., R. 48 W., S. 26; on main line Union Pacific Railroad	3,955.5
T. 14 N., R. 47 W., S. 30; near milepost 403 Sunol switch; iron post marked "SIDNEY 3921"	3,921.025
T. 14 N., R. 47 W., S. 29; west side of; on main line Union Pacific Railroad	3,908.6
T. 14 N., R. 47 W., S. 27; west side of; on main line Union Pacific Railroad; iron post marked "SIDNEY 3878"	3,878.088
T. 14 N., R. 47 W., S. 25; west side of; on main line Union Pacific Railroad	3,852.5
T. 14 N., R. 47 W., S. 25; east side of; on main line Union Pacific Railroad	3,839.7
T. 14 N., R. 47 W., S. 24; southeast corner of	3,878.9
T. 14 N., R. 47 W., S. 12; southeast corner of; iron post marked "SIDNEY 4011"	4,011.418
T. 14 N., R. 46 W., S. 30; Lodgepole, Kansas, stone monument in park; bronze tablet marked "SIDNEY 3833"	3,832.755
T. 13 N., R. 48 W., S. 3; northeast corner of; iron post marked "SIDNEY 4013"	4,013.457
T. 13 N., R. 48 W., S. 3; southeast corner of	4,119.1
T. 13 N., R. 48 W., S. 10; southeast corner of	4,099
T. 13 N., R. 48 W., S. 22; southeast corner of; iron post marked "SIDNEY 4162"	4,162.220
T. 13 N., R. 48 W., S. 27; southeast corner of	4,169
T. 13 N., R. 48 W., S. 34; southeast corner of; iron post marked "SIDNEY 4167"	4,167.252
T. 13 N., R. 48 W., S. 26; southeast corner of	4,145.4
T. 13 N., R. 48 W., S. 25; southeast corner of; iron post marked "SIDNEY 4131"	4,131.229
T. 13 N., R. 47 W., S. 30; southeast corner of	4,113.3
T. 13 N., R. 47 W., S. 29; southeast corner of	4,122.6
T. 13 N., R. 47 W., S. 28; southeast corner of	4,102.6
T. 13 N., R. 47 W., S. 33; southeast corner of; iron post marked "SIDNEY 4117"	4,117.222
T. 13 N., R. 47 W., S. 27; southeast corner of	4,106
T. 13 N., R. 47 W., S. 25; southeast corner of; iron post marked "SIDNEY 4078"	4,077.901
T. 13 N., R. 46 W., S. 29; southwest corner of	4,037
T. 16 N., R. 46 W., S. 36; southeast corner of; iron post marked "SIDNEY 3933"	3,933.187
T. 15 N., R. 46 W., S. 27; southwest corner of; iron post marked "SIDNEY 3928"	3,928.099
T. 15 N., R. 46 W., S. 27; southeast corner of	3,921.3
T. 15 N., R. 46 W., S. 26; southeast corner of	3,931.8

	Feet.
T. 15 N., R. 46 W., S. 25; southeast corner of; iron post marked "SIDNEY 3896"	3,896.123
T. 15 N., R. 46 W., S. 24; southeast corner of	3,920.5
T. 15 N., R. 46 W., S. 13; southeast corner of	3,906.7
T. 15 N., R. 46 W., S. 13; ¼ corner east side of; iron post marked "SIDNEY 3885"	3,884.953
T. 13 N., R. 46 W., S. 27; southeast corner of; iron post marked "SIDNEY 3983"	3,982.950
T. 13 N., R. 46 W., S. 26; southeast corner of	3,953.8
T. 13 N., R. 46 W., S. 25; southeast corner of	3,926.2
T. 13 N., R. 46 W., S. 3; near milepost 393, Union Pacific Railroad	3,778.4
T. 13 N., R. 46 W., S. 2; near milepost 392, Union Pacific Railroad	3,765.1
T. 13 N., R. 46 W., S. 2; southeast corner of; iron post marked "SIDNEY 3757"	3,757.233
T. 13 N., R. 45 W., S. 30; southeast corner of; iron post marked "SIDNEY 3897"	3,897.384
T. 12 N., R. 46 W., S. 9; southeast corner of; iron post marked "SIDNEY 3908"	3,908.216
T. 18 N., R. 44 W., S. 34; Hartmann post-office; iron post marked "SIDNEY 3595"	3,595.077
T. 17 N., R. 45 W., S. 23; Coumbe's ranch; iron post marked "SIDNEY 3423"	3,422.450
T. 17 N., R. 44 W., S. 1; southwest corner of; iron post marked "SIDNEY 3601"	3,600.520
T. 17 N., R. 44 W., S. 12; southwest corner of	3,519
T. 17 N., R. 44 W., S. 13; southwest corner of	3,461.5
T. 17 N., R. 44 W., S. 24; southwest corner of; iron post marked "SIDNEY 3428"	3,427.794
T. 17 N., R. 44 W., S. 25; southwest corner of	3,400.3
T. 17 N., R. 44 W., S. 36; southwest corner of	3,376.6
T. 17 N., R. 44 W., S. 32; McHatton's ranch	3,405
T. 17 N., R. 44 W., S. 32; southwest corner of; iron post marked "SIDNEY 3455"	3,455.088
T. 17 N., R. 43 W., S. 8; southwest corner of; iron post marked "SIDNEY 3920"	3,919.491
T. 17 N., R. 43 W., S. 11; southwest corner of	3,742.4
T. 17 N., R. 43 W., S. 11; ¼ corner, south side of; iron post marked "SIDNEY 3710"	3,709.258
T. 17 N., R. 42 W., S. 18; road crossing in northeast ¼ of; iron post marked "SIDNEY 3741"	3,740.829
T. 17 N., R. 42 W., S. 29; side of wagon road in southwest ¼ of; iron post marked "SIDNEY 3643"	3,642.903
T. 17 N., R. 41 W., S. 34; on wagon road near southeast corner of; iron post marked "SIDNEY 3632"	3,631.775
T. 17 N., R. 41 W., S. 31; southwest corner of; iron post marked "SIDNEY 3628"	3,628.244
T. 16 N., R. 44 W., S. 5; near northeast corner of, south bank North Platte River; iron post marked "SIDNEY 3427"	3,426.700
North Platte River, Oshkosh Bridge, water level	3,368
T. 16 N., R. 44 W., S. 10; ¼ corner, east side of; iron post marked "SIDNEY 3393"	3,392.674
T. 16 N., R. 43 W., S. 18; Charles Simpson's ranch; iron post marked "SIDNEY 3365"	3,364.230
T. 16 N., R. 43 W., S. 22; ¼ corner, east side of; iron post marked "SIDNEY 3332"	3,331.748

	Feet.
T. 16 N., R. 42 W., S. 31; near mouth of ravine; iron post marked "SIDNEY 3357"	3,356.959
T. 16 N., R. 42 W., S. 27; southeast corner of; iron post marked "SIDNEY 3304"	3,304.008
T. 16 N., R. 42 W., S. 12; southeast corner of; iron post marked "SIDNEY 3593"	3,592.772
T. 16 N., R. 41 W., S. 30; southeast corner of; iron post marked "SIDNEY 3309"	3,308.466
T. 15 N., R. 45 W., S. 27; southeast corner of; iron post marked "SIDNEY 3923"	3,923.068
T. 15 N., R. 45 W., S. 36; southeast corner of	3,873.6
T. 15 N., R. 44 W., S. 30; southeast corner of; iron post marked "SIDNEY 3829"	3,829.382
T. 15 N., R. 44 W., S. 29; southeast corner of	3,810.8
T. 15 N., R. 44 W., S. 28; southeast corner of	3,803.8
T. 15 N., R. 44 W., S. 27; southeast corner of; iron post marked "SIDNEY 3792"	3,792.15
T. 15 N., R. 44 W., S. 26; southeast corner of	3,780.2
T. 15 N., R. 44 W., S. 25; southeast corner of	3,777.3
T. 15 N., R. 44 W., S. 34; southeast corner of	3,799
T. 15 N., R. 43 W., S. 30; southeast corner of; iron post marked "SIDNEY 3833"	3,833.220
T. 15 N., R. 43 W., S. 27; southeast corner of; iron post marked "SIDNEY 3729"	3,728.662
T. 15 N., R. 42 W., S. 3; mouth of Ash Hollow, near Rachael Patterson's grave; iron post marked "SIDNEY 3314"	3,314.206
T. 15 N., R. 42 W., S. 26; forks of wagon road; iron post marked "SIDNEY 3763"	3,763.153
T. 15 N., R. 42 W., S. 36; southeast corner of; iron post marked "SIDNEY 3739"	3,739.322
T. 14 N., R. 45 W., S. 5; southeast corner of; iron post marked "SIDNEY 3916"	3,916.072
T. 14 N., R. 45 W., S. 4; southeast corner of	3,901.5
T. 14 N., R. 45 W., S. 3; southeast corner of	3,889
T. 14 N., R. 45 W., S. 2; southeast corner of; iron post marked "SIDNEY 3874"	3,874.043
T. 14 N., R. 44 W., S. 3; southeast corner of	3,794.9
T. 14 N., R. 44 W., S. 10; southeast corner of; iron post marked "SIDNEY 3796"	3,796.152
T. 14 N., R. 44 W., S. 15; southeast corner of	3,786
T. 14 N., R. 44 W., S. 27; southeast corner of; iron post marked "SIDNEY 3804"	3,804.321
T. 14 N., R. 44 W., S. 34; southeast corner of	3,743.6
T. 14 N., R. 44 W., S. 11; southeast corner of	3,778.9
T. 14 N., R. 44 W., S. 12; southeast corner of	3,776.1
T. 14 N., R. 43 W., S. 7; southeast corner of; iron post marked "SIDNEY 3768"	3,767.974
T. 14 N., R. 43 W., S. 10; southeast corner of; iron post marked "SIDNEY 3764"	3,764.154
T. 14 N., R. 43 W., S. 11; southeast corner of	3,713
T. 14 N., R. 42 W., S. 6; southeast corner of; iron post marked "SIDNEY 3723"	3,722.121
T. 14 N., R. 42 W., S. 5; southeast corner of	3,706
T. 14 N., R. 42 W., S. 3; southeast corner of; iron post marked "SIDNEY 3694"	3,694.097

	Feet.
T. 14 N., R. 42 W., S. 2; southeast corner of	3,731.2
T. 14 N., R. 42 W., S. 1; southeast corner of	3,706.7
T. 14 N., R. 42 W., S. 12; southeast corner of	3,667.2
T. 14 N., R. 42 W., S. 13; southeast corner of; iron post marked "SIDNEY 3652"	3,651.791
T. 14 N., R. 42 W , S. 25; southeast corner of	3,626.2
T. 14 N., R. 42 W., S. 36; southeast corner of	3,615.9
T. 13 N., R. 45 W., S. 15; railroad depot, Chappell; iron post marked "SIDNEY 3696"	3,696.084
T. 13 N., R. 44 W., S. 31; mile post 383, Union Pacific Railroad; iron post marked "SIDNEY 3636"	3,635.921
T. 13 N., R. 44 W., S. 3; southeast corner of	3,779.1
T. 13 N., R. 44 W., S. 10; southeast corner of; iron post marked "SIDNEY 3793"	3,793.021
T. 13 N., R. 44 W., S. 11; southeast corner of	3,766.3
T. 13 N., R. 43 W., S. 18; southeast corner of; iron post marked "SIDNEY 3717"	3,717.196
T. 13 N., R. 43 W., S. 17; southeast corner of	3.650.5
T. 13 N., R. 43 W., S. 16; southeast corner of	3,640.6
T. 13 N., R. 43 W., S. 15; southeast corner of	3,576
T. 13 N., R. 43 W., S. 14; ¼ corner south side of; iron post marked "SIDNEY 3648"	3,647.963
T. 13 N., R. 43 W., S. 13; southeast corner of	3,619.4
T. 13 N., R. 42 W., S. 18; southeast corner of	3,600.7
T. 13 N., R. 42 W., S. 17; ¼ corner south side of; iron post marked "SIDNEY 3592"	3,591.778
T. 13 N., R. 42 W., S. 2; southeast corner of	3,625.5
T. 13 N., R. 42 W., S. 1; southeast corner of; iron post marked "SIDNEY 3613"	3,613.028
T. 13 N., R. 42 W., S. 12; southeast corner of	3,560.2
T. 13 N., R. 42 W., S. 24; southeast corner of	3,498.9
T. 13 N., R. 42 W., S. 25; southeast corner of, Big Springs; iron post marked "SIDNEY 3370"	3,370.061
T. 12 N., R. 45 W., at section corner on State line Nebraska–Colorado, ¼ mile west of Lodgepole Creek; iron post marked "SIDNEY 3591"	3,590.886
T. 12 N., R. 42 W., S. 6; mile post 365, Union Pacific Railroad; iron post marked "SIDNEY 3413"	3,413.057
T. 15 N., R. 41 W., S. 4; ¼ corner east side of; iron post marked "SIDNEY 3261"	3,260.677
T. 13 N., R. 41 W., S. 27; mile post 357, Union Pacific Railroad; iron post marked "SIDNEY 3341"	3,340.735
T. 12 N., R. 45 W.; astronomical monument, Julesburg; bronze tablet marked "SIDNEY 3560"	3,560.480
T. 12 N., R. 44 W.; railroad depot, Julesburg; iron post marked "SIDNEY 3469"	3,469.064
T. 17 N., R. 40 W., S. 36; in southeast ¼ of, north end of valley; iron post marked "SIDNEY 3564"	3,564.185
T. 17 N., R. 39 W., S. 4; in southeast ¼ of, side of wagon road in valley; iron post marked "SIDNEY 3612"	3,611.980
T. 17 N., R. 39 W., S. 11; Mahaffey's windmill	3,581.7
T. 17 N., R. 39 W., S. 23; in northeast ¼ of, forks of wagon road; iron post marked "SIDNEY 3575"	3,574.886
T. 17 N., R. 38 W., S. 6; east side of, in small valley; iron post marked "SIDNEY 3588"	3,587.711
T. 17 N., R. 38 W., S. 29; in southeast ¼ of, side of road in valley; iron post marked "SIDNEY 3533"	3,533.370

	Feet.
T. 17 N., R. 37 W., S. 10; west side of, side of road in valley; iron post marked "SIDNEY 3504"	3,504.235
T. 17 N., R. 37 W., S. 27; in southwest ¼ of, side of wagon road in valley; iron post marked "SIDNEY 3490"	3,490.013
T. 16 N., R. 40 W., S. 13; southeast corner of; iron post marked "SIDNEY 3529"	3,529.104
T. 16 N., R. 40 W., S. 36; in northeast ¼ of, Winslow's ranch; iron post marked "SIDNEY 3405"	3,404.659
T. 16 N., R. 39 W., S. 16; near center of, at junction of wagon roads; iron post marked "SIDNEY 3523"	3,523.032
T. 16 N., R. 39 W., S. 2; in south ¼ of, side of wagon road; iron post marked "SIDNEY 3520"	3,520.056
T. 16 N., R. 38 W., S. 9; in southeast ¼ of, side of wagon road in Wild Horse Valley; iron post marked "SIDNEY 3485"	3,484.798
T. 16 N., R. 38 W., S. 26; in south ¼ of, side of wagon road; iron post marked "SIDNEY 3430"	3,430.175
T. 16 N., R. 37 W., S. 8; in south ¼ of, forks of road; iron post marked "SIDNEY 3472"	3,472.029
T. 16 N., R. 37 W., S. 20; southeast corner of, near Mannon's ranch; iron post marked "SIDNEY 3435"	3,435.088
T. 15 N., R. 40 W., S. 6; at Fairchild's ranch; iron post marked "SIDNEY 3233"	3,233.232
T. 15 N., R. 40 W., S. 11; southeast corner of; iron post marked "SIDNEY 3216"	3,216.144
T. 15 N., R. 39 W., S. 20; southeast corner of; iron post marked "SIDNEY 3184"	3,183.873
T. 15 N., R. 39 W., S. 26; at schoolhouse; iron post marked "SIDNEY 3161"	3,161.352
T. 15 N., R. 38 W., S. 31; west side of, Ogalalla Bridge over North Platte River; water level	3,146
T. 15 N., R. 38 W., S. 30; southeast corner of; iron post marked "SIDNEY 3146"	3,145.921
T. 15 N., R. 38 W., S. 13; in northwest ¼ of; iron post marked "SIDNEY 3306"	3,306.111
T. 15 N., R. 38 W., S. 36; southeast corner of	3,115.6
T. 15 N., R. 37 W., S. 6; in northwest ¼ of; iron post marked "SIDNEY 3373"	3,373.345
T. 15 N., R. 37 W., S. 31; southeast corner of; iron post marked "SIDNEY 3107"	3,106.813
T. 14 N., R. 41 W., S. 13; southeast corner of	3,721.2
T. 14 N., R. 41 W., S. 15; southeast corner of; iron post marked "SIDNEY 3712"	3,712.077
T. 14 N., R. 40 W., S. 17; ¼ corner south side of; iron post marked "SIDNEY 3579"	3,578.688
T. 14 N., R. 40 W., S. 15; southeast corner of	3,658
T. 14 N., R. 40 W., S. 14; southeast corner of; iron post marked "SIDNEY 3653"	3,653.213
T. 14 N., R. 39 W., S. 32; ¼ corner east side of; iron post marked "SIDNEY 3489"	3,488.754
T. 14 N., R. 39 W., S. 13; near southeast corner of, forks of road; iron post marked "SIDNEY 3533"	3,533.079
T. 13 N., R. 40 W., S. 19; at milepost 354, Union Pacific Railroad; iron post marked "SIDNEY 3333"	3,333.172
T. 13 N., R. 40 W., S. 15; at Brule; iron post marked "SIDNEY 3291"	3,290.766
T. 13 N., R. 39 W., S. 17; at milepost 347, Union Pacific Railroad; iron post marked "SIDNEY 3265"	3,265.151

	Feet.
T. 13 N., R. 39 W., S. 11; at milepost 344, Union Pacific Railroad; iron post marked "SIDNEY 3242"	3,242.138
T. 13 N., R. 38 W., S. 6; Ogalalla Railroad depot; iron post marked "SIDNEY 3216"	3,215.884
T. 13 N., R. 38 W., S. 6; South Platte River, water level, under bridge	3,210

SOUTH DAKOTA AND IOWA.

LINCOLN, TURNER, CLAY, AND UNION COUNTIES, SOUTH DAKOTA, AND PLYMOUTH COUNTY, IOWA.

CANTON QUADRANGLE.

The elevations in the following list are based on the Mississippi River Commission bench mark at Yankton, the same datum being used for the Olivet and Parker quadrangles, surveyed in the season of 1896. The bench mark consists of a stone in the bottom of a hollow post in the courthouse yard, the elevation of which is 1,197.291 feet above mean sea level. (See Eighteenth Annual Report, Part I, p. 341.)

All bench marks set during current year were marked "YNKTN," in addition to figures of elevation.

The leveling was done by Mr. Alfred Tyler, levelman. In addition to the work on the Canton quadrangle, levels were carried over the northwest corner of the Olivet quadrangle, in Hutchinson County, by Mr. E. S. Smith, levelman, both districts being under the general direction of Mr. W. H. Griffin, topographer.

	Feet.
T. 95 N., R. 48 W., S. 6; northwest corner of; iron post marked "YNKTN 1438"	1,437.639
T. 95 N., R. 49 W., S. 1; root of tree 150 feet west from northwest corner of	1,436.87
T. 95 N., R. 49 W., S. 3; northwest corner of (ground)	1,363
T. 95 N., R. 49 W., S. 4; northwest corner of (ground)	1,418
T. 95 N., R. 49 W., S. 5; northwest corner of (ground)	1,412
T. 95 N., R. 49 W., S. 6; northwest corner of; iron post marked "YNKTN 1390"	1,390.274
T. 95 N., R. 50 W., S. 1; northwest corner of (ground)	1,421.6
T. 95 N., R. 50 W., S. 2; northwest corner of (ground)	1,420
T. 95 N., R. 50 W., S. 3; northwest corner of (ground)	1,484
T. 95 N., R. 50 W., S. 4; northwest corner of; rock at road crossing	1,501.3
T. 95 N., R. 50 W., S. 5; northwest corner of; rock at road crossing	1,466.4
T. 95 N., R. 50 W., S. 6; northwest corner of; iron post marked "YNKTN 1422"	1,421.834
T. 95 N., R. 51 W., S. 1; northwest corner of (ground)	1,349
T. 95 N., R. 51 W., S. 3; northwest corner of; rock at section corner	1,311.4
T. 95 N., R. 51 W., S. 4; rock 100 feet west from northwest corner of	1,281.3
T. 95 N., R. 51 W., S. 5; northwest corner of (ground)	1,270
T. 95 N., R. 51 W., S. 6; northwest corner of; iron post marked "YNKTN 1254"	1,253.601
T. 96 N., R. 48 W., S. 6; northwest corner of; iron post marked "YNKTN 1485"	1,485.374
T. 96 N., R. 48 W., S. 7; northwest corner of; stump at road crossing	1,456.44
T. 96 N., R. 48 W., S. 7; stake 300 feet north from northwest corner of	1,421.4
T. 96 N., R. 48 W., S. 19; northwest corner of (ground)	1,415

	Feet.
T. 96 N., R. 48 W., S. 31; northwest corner of (ground)	1,400
T. 96 N., R. 49 W.; Burlington, Cedar Rapids and Northern Railroad, crossing of line between sections 22 and 23; top of rail	1,293.4
T. 96 N., R. 49 W., S. 1; northwest corner of (ground)	1,461
T. 96 N., R. 49 W., S. 2; northwest corner of (ground)	1,484
T. 96 N., R. 49 W., S. 3; northwest corner of (ground)	1,541
T. 96 N., R. 49 W., S. 5; northwest corner of (ground)	1,520
T. 96 N., R. 49 W., S. 6; northwest corner of; iron post marked "YNKTN 1538"	1,537.739
T. 96 N., R. 50 W., S. 1; rock 50 feet west from northwest corner of	1,557.9
T. 96 N., R. 50 W., S. 2; northwest corner of; rock at section corner	1,532.3
T. 96 N., R. 50 W., S. 3; northwest corner of (ground)	1,500
T. 96 N., R. 50 W., S. 5; rock 300 feet east from northwest corner of	1,440.7
T. 96 N., R. 50 W., S. 6; northwest corner of; iron post marked "YNKTN 1372"	1,371.885
T. 96 N., R. 51 W., S. 1; northwest corner of; rock at section corner	1,324.1
T. 96 N., R. 51 W., S. 2; 100 feet west from northwest corner of; nail in bridge	1,286.29
T. 96 N., R. 51 W., S. 4; northwest corner of; rock at section corner	1,263.8
T. 96 N., R. 51 W., S. 5; northwest corner of; rock at section corner	1,257.3
T. 96 N., R. 51 W., S. 6; northwest corner of; iron post marked "YNKTN 1217"	1,217.029
T. 96 N., R. 52 W., S. 12; northeast corner of; rock at section corner	1,257.5
T. 96 N., R. 52 W., S. 13; northeast corner of; rock at road crossing	1,255.1
T. 96 N., R. 52 W., S. 36; northeast corner of (ground)	1,250
T. 96 N., R. 52 W.; Chicago, Northwestern Railroad, crossing of line between sections 4 and 9, top of rail	1,251.4
T. 96 N., R. 52 W.; Chicago, Northwestern Railroad, crossing of line between sections 15 and 16, top of rail	1,244.7
T 96 N., R. 52 W.; Chicago, Northwestern Railroad, crossing of line between sections 15 and 22, top of rail	1,209.6
T. 96 N., R. 52 W.; Chicago, Northwestern Railroad, crossing of line between sections 22 and 27, top of rail	1,214.6
T. 96 N., R. 52 W.; Chicago, Northwestern Railroad, crossing of line between sections 28 and 33, top of rail	1,219.7
T. 97 N., R. 48 W., S. 6; northwest corner of; iron post marked "YNKTN 1274"	1,273.834
T. 97 N., R. 49 W., S. 1; northwest corner of; rock at section corner	1,307.8
T. 97 N., R. 49 W., S. 3; northwest corner of (ground)	1,326
T. 97 N., R. 49 W., S. 4; northwest corner of (ground)	1,324
T. 97 N., R. 49 W., S. 5; northwest corner of (ground)	1,340
T. 97 N., R. 49 W., S. 6; northwest corner of; land post marked "1337"	1,336.6
T. 97 N., R. 50 W., S. 1; northwest corner of (ground)	1,330
T. 97 N., R. 50 W., S. 2; northwest corner of; rock at road crossing	1,331.8
T. 97 N., R. 50 W., S. 3; northwest corner of (ground)	1,324.1
T. 97 N., R. 50 W., S. 4; northwest corner of; rock at road crossing	1,328.7
T. 97 N., R. 50 W., S. 6; northwest corner of; iron post marked "YNKTN 1299"	1,298.836
T. 97 N., R. 51 W., S. 1; northwest corner of (ground)	1,284
T. 97 N., R. 51 W., S. 2; northwest corner of; rock at section corner	1,287.6
T. 97 N., R. 51 W., S. 3; northwest corner of; rock at section corner	1,282.2
T. 97 N., R. 51 W., S. 4; northwest corner of; rock at road crossing	1,275.4
T. 97 N., R. 51 W., S. 5; northwest corner of; rock at section corner	1,280.6
T. 97 N., R. 51 W., S. 6; northwest corner of; iron post marked "YNKTN 1273"	1,272.507

	Feet.
T. 97 N., R. 52 W., S. 1; northwest corner of; rock at road crossing	1,254.5
T. 97 N., R. 52 W., S. 2; northwest corner of; rock at road crossing	1,246.6
Great Northern Railroad, crossing of line between Tps. 97 and 98 N., R. 52 W., top of rail	1,250.5
T. 98 N., R. 48 W., S. 6; northwest corner of; iron post marked "YNKTN 1329"	1,329.471
T. 98 N., R. 49 W., S. 1; northwest corner of (ground)	1,349
T. 98 N., R. 49 W., S. 2; northwest corner of; rock at road crossing	1,372.8
Chicago, Milwaukee and St. Paul Railroad, crossing of line between Tps. 98 and 99 N., R. 49 W., top of rail	1,378.3
T. 98 N., R. 49 W., S. 3; northwest corner of; rock at section corner	1,362.6
T. 98 N., R. 49 W., S. 4; northwest corner of; rock at road crossing	1,360
T. 98 N., R. 49 W., S. 5; northwest corner of; rock at section corner	1,362.2
T. 98 N., R. 49 W., S. 6; northwest corner of; iron post marked "YNKTN 1372"	1,371.714
T. 98 N., R. 49 W.; Chicago, Milwaukee and St. Paul Railroad, crossing of line between sections 2 and 11, top of rail	1,343.8
T. 98 N., R. 49 W.; Chicago, Milwaukee and St. Paul Railroad, crossing of line between sections 14 and 23, top of rail, Canton, South Dakota	1,271.1
T. 98 N., R. 49 W., S. 25; northwest corner of (ground)	1,233
T. 98 N., R. 50 W., S. 1; northwest corner of; rock at road crossing	1,345.7
T. 98 N., R. 50 W., S. 2; northwest corner of; rock at road crossing	1,346.2
T. 98 N., R. 50 W., S. 3; northwest corner of; nail in east end of bridge	1,343.53
T. 98 N., R. 50 W., S. 4; northwest corner of (ground)	1,362
T. 98 N., R. 50 W., S. 5; northwest corner of; rock at road crossing	1,354.8
T. 98 N., R. 50 W.. S. 6; northwest corner of; iron post marked "YNKTN 1349"	1,348.823
T. 98 N., R. 51 W., S. 2; near northeast corner of, height of rail Chicago, Milwaukee and St. Paul Railroad	1,342.2
T. 98 N., R. 51 W., S. 2; northwest corner of; rail east end of bridge	1,329.5
T. 98 N., R. 51 W., S. 3; northwest corner of; nail east end of bridge	1,329.43
T. 98 N., R. 51 W., S. 4; northwest corner of; rock at road crossing	1,331.1
Great Northern Railroad, top of rail, crossing of line between townships 98 and 99 N., R. 51 W	1,324.4
T. 98 N., R. 51 W., S. 6; northwest corner of; iron post marked "YNKTN 1335"	1,334.710
T. 99 N., R. 48 W., S. 7; northwest corner of; rock at road crossing	1,317.1
T. 99 N., R. 48 W., S. 19; northwest corner of; rock at road crossing	1,368.7
T. 99 N., R. 48 W., S. 30; northwest corner of; rock at road crossing	1,350.6
T. 99 N., R. 48 W., S. 31; northwest corner of; rock at section corner	1,355.1
T. 99 N., R. 49 W., S. 6; northwest corner of; iron post marked "YNKTN 1419"	1,419.074
T. 99 N., R. 49 W., S. 7; northwest corner of; rock at road crossing	1,390.6
T. 99 N., R. 49 W.; Chicago, Milwaukee and St. Paul Railroad, crossing of line between sections 7 and 18, top of rail	1,397.3
T. 99 N., R. 49 W.; Chicago, Milwaukee and St. Paul Railroad, crossing of line between sections 17 and 18, top of rail	1,394.5
T. 99 N., R. 49 W.; Chicago, Milwaukee and St. Paul Railroad, crossing of line between sections 28 and 29, top of rail	1,416.5
T. 99 N., R. 49 W.; Chicago, Milwaukee and St. Paul Railroad, crossing of line between sections 33 and 34, top of rail	1,380.1
T. 99 N., R. 50 W., S. 1; northwest corner of; rock at road crossing	1,425.8
T. 99 N., R. 50 W., S. 2; rock 150 feet east from northwest corner of	1,441.5
T. 99 N., R. 50 W., S. 3; northwest corner of (ground)	1,441

	Feet.
T. 99 N., R. 50 W., S. 4; northwest corner of; rock at section corner	1,456.7
T. 99 N., R. 50 W., S. 5; northwest corner of; rock at section corner	1,447.2
T. 99 N., R. 50 W., S. 6; northwest corner of; iron post marked "YNKTN 1461"	1,461.191
T. 99 N., R. 51 W., S. 2; northwest corner of (ground)	1,464
T. 99 N., R. 51 W., S. 3; rock 60 feet east from northwest corner of	1,444.6
T. 99 N., R. 51 W., S. 4; northwest corner of; rock at section corner	1,434.6
T. 99 N., R. 51 W., S. 5; northwest corner of; rock at section corner	1,425.8
T. 99 N., R. 51 W., S. 6; northwest corner of; iron post marked "YNKTN 1448"	1,448.066
T. 99 N., R. 52 W., S. 12; northeast corner of (ground)	1,433
T. 99 N., R. 52 W., S. 13; northeast corner of (ground)	1,407
T. 99 N., R. 52 W., S. 24; northeast corner of; rock at section corner	1,397.4
T. 99 N., R. 52 W., S. 25; northeast corner of; rock at road crossing	1,358.6
Chicago, Milwaukee and St. Paul Railroad, top of rail, crossing of line between ranges 51 and 52 W., T. 99 N	1,333
T. 99 N., R. 52 W.; Chicago, Milwaukee and St. Paul Railroad, crossing of line between sections 25 and 26, top of rail	1,358.1
T. 99 N., R. 52 W.; Chicago, Milwaukee and St. Paul Railroad, crossing of line between sections 26 and 27, top of rail	1,370.6
T. 99 N., R. 52 W.; Chicago, Milwaukee and St. Paul Railroad, crossing of line between sections 27 and 28, top of rail	1,366.9
T. 100 N., R. 49 W.; Burlington, Cedar Rapids and Northern Railroad, crossing of line between sections 21 and 22, top of rail	1,342
T. 100 N., R. 49 W.; Burlington, Cedar Rapids and Northern Railroad, crossing of line between sections 20 and 21, top of rail	1,402.4
T. 100 N., R. 49 W.; Burlington, Cedar Rapids and Northern Railroad, crossing of line between sections 8 and 17, top of rail	1,429
T. 100 N., R. 49 W.; Burlington, Cedar Rapids and Northern Railroad, crossing of line between sections 7 and 8, top of rail	1,445.2
T. 100 N., R. 49 W.; Burlington, Cedar Rapids and Northern Railroad, bridge across Sioux River; bolthead in west end of	1,282.6
T. 100 N., R. 49 W., S. 7; northwest corner of; iron post marked "YNKTN 1484"	1,483.565
T. 100 N., R. 50 W., S. 12; northwest corner of; rock at section corner	1,496.3
T. 100 N., R. 50 W., S. 9; northwest ¼ of; rock in road under trestle, Great Northern Railroad	1,409.3
T. 100 N., R. 50 W., S. 8; northwest corner of; rock at road crossing	1,458.6
T. 100 N., R. 50 W., S. 7; northwest corner of; iron post marked "YNKTN 1504"	1,504.427
T. 100 N., R. 51 W., S. 11; northwest corner of; rock at section corner	1,524.8
T. 100 N., R. 51 W., S. 10; northwest corner of; rock at section corner	1,510.4
T. 100 N., R. 51 W., S. 8; northwest corner of; rock at section corner	1,500.9
T. 100 N., R. 51 W., S. 7; northwest corner of; iron post marked "YNKTN 1534"	1,533.755
T. 100 N., R. 52 W., S. 12; northwest corner of; rock at section corner	1,556
T. 100 N., R. 52 W., S. 11; northwest corner of; rock at section corner	1,577.9
T. 100 N., R. 52 W., S. 10; ¼ corner north side of	1,616.9
T. 100 N., R. 48 W., S. 19; northwest corner of; iron post marked "YNKTN 1343"	1,343.387
Burlington, Cedar Rapids and Northern Railroad, crossing of line between townships 48 and 49, top of rail	1,308
T. 99 N., R. 48 W., S. 6; northwest corner of; iron post marked "YNKTN 1420"	1,419.862

NORTH DAKOTA.

FOSTER AND STUTSMAN COUNTIES.

PINGREE QUADRANGLE.

The elevations in the following list are based on a bench mark established by the United States Geological Survey at the southwest corner of sec. 19, T. 141 N., R. 64 W., consisting of the standard iron post marked 1529, the adjusted elevation of which is 1,529.436 feet above mean sea level. The initial height on which the leveling in this locality rests is the elevation of the top of rail of Northern Pacific Railroad in front of Jamestown depot, accepting the railroad company's elevation as 1,407.5.

All bench marks set in the progress of this work were marked "JMTN" in addition to the figures of elevation.

The leveling was done by Mr. Alfred Tyler, levelman, under the direction of Mr. W. H. Griffin, topographer.

	Feet.
T. 141 N., R. 62 W., S. 6; northwest corner of; iron post marked "JMTN 1511"	1,511.248
T. 141 N., R. 62 W., S. 6; ¼ corner west side of	1,514
T. 141 N., R. 62 W., S. 18; northwest corner of; rock 100 feet east of corner.	1,494.4
T. 141 N., R. 62 W., S. 30; northwest corner of; iron post marked "JMTN 1455"	1,454.842
T. 141 N., R. 63 W., S. 7; northwest corner of; rock at road crossing	1,514.7
T. 141 N., R. 63 W., S. 30; northwest corner of; iron post marked "JMTN 1435"	1,434.524
T. 141 N., R. 63 W., S. 29; northwest corner of; rock at road crossing	1,483.9
T. 141 N., R. 63 W., S. 28; northwest corner of (ground)	1,509
T. 141 N., R. 63 W., S. 27; northwest corner of (ground)	1,507
T. 141 N., R. 63 W., S. 26; ¼ corner, north side of, rock at ¼ corner	1,500.9
T. 141 N., R. 64 W., S. 19; southwest corner of; iron post marked "JMTN 1529"	1,529.436
T. 141 N., R. 64 W., S. 20; southwest corner of; rock at road crossing	1,522.9
T. 141 N., R. 64 W., S. 21; southwest corner of; foundation of schoolhouse, southeast corner of	1,518.38
T. 141 N., R. 64 W., S. —; Northern Pacific Railroad, top of rail, crossing of east and west line between sections 22 and 24	1,514.7
T. 141 N., R. 64 W., S. 24; southwest corner of; rock at section corner	1,438.5
T. 141 N., R. 64 W., S. —; James River water level, crossing of line between sections 24 and 25	1,404
T. 141 N., R. 65 W., S. 7; northwest corner of (ground)	1,619
T. 141 N., R. 65 W., S. 18; northwest corner of; rock at section corner	1,637.1
T. 141 N., R. 65 W., S. 19; southwest corner of; iron post marked "JMTN 1645"	1,644.770
T. 141 N., R. 65 W., S. 20; southwest corner of; rock at section corner	1,581.9
T. 141 N., R. 65 W., S. 21; southwest corner of (ground)	1,550
T. 141 N., R. 65 W., S. 22; southwest corner of (ground)	1,544
T. 141 N., R. 65 W., S. 23; southwest corner of (ground)	1,528
T. 142 N., R. 62 W., S. 6; northwest corner of; iron post marked "JMTN 1541"	1,540.995
T. 142 N., R. 62 W., S. 7; northwest corner of; rock at road crossing	1,538.9

	Feet.
T. 142 N., R. 62 W., S. 18; ¼ corner, west side of	1,531
T. 142 N., R. 62 W., S. 31; water level Spirit Wood Lake	1,439
T. 142 N., R. 63 W., S. 7; northwest corner of (ground)	1,514
T. 142 N., R. 63 W., S. 18; northwest corner of (ground)	1,520
T. 142 N., R. 63 W., S. 19; northwest corner of; rock at road crossing	1,482.5
T. 142 N., R. 63 W., S. 31; northwest corner of; rock at road crossing	1,496.7
T. 142 N., R. 63 W., S. 31; southwest corner of; iron post marked "JMTN 1465"	1,465.183
T. 142 N., R. 64 W., S. 7; northwest corner of; rock at road crossing	1,537
T. 142 N., R. 64 W., S. 19; northwest corner of; rock at road crossing	1,545.1
T. 142 N., R. 64 W., S. 30; northwest corner of (ground)	1,557
T. 142 N., R. 64 W., S. 31; northwest corner of (ground)	1,556
T. 142 N., R. 64 W., S. 31; southwest corner of; iron post marked "JMTN 1550"	1,550.337
T. 142 N., R. 65 W., S. 7; northwest corner of; rock at section corner	1,558.8
T. 142 N., R. 65 W., S. 7; rock 1,000 feet north of southwest corner of	1,570
T. 142 N., R. 65 W., S. 19; northwest corner of (ground)	1,606
T. 142 N., R. 65 W., S. 30; northwest corner of; rock at section corner	1,615.6
T. 142 N., R. 65 W., S. 31; southwest corner of; iron post marked "JMTN 1646"	1,645.786
T. 143 N., R. 62 W., S. 6; northwest corner of; iron post marked "JMTN 1525"	1,524.545
T. 143 N., R. 62 W., S. 7; northwest corner of (ground)	1,511
T. 143 N., R. 62 W., S. 19; northwest corner of; rock at road crossing	1,539.3
T. 143 N., R. 62 W., S. 30; northwest corner of; rock at road crossing	1,547.2
T. 143 N., R. 62 W., S. 31; northwest corner of (ground)	1,548
T. 143 N., R. 63 W., S. 7; northwest corner of	1,505.3
T. 143 N., R. 63 W., S. 19; northwest corner of; rock at road crossing	1,513.6
T. 143 N., R. 63 W., S. 3; northwest corner of (ground)	1,519
T. 143 N., R. 63 W., S. 31; northwest corner of (ground)	1,538
T. 143 N., R. 63 W., S. 31; southwest corner of; iron post marked "JMTN 1522"	1,521.976
T. 143 N., R. 64 W., S. 31; southwest corner of; iron post marked "JMTN 1533"	1,533.092
T. 143 N., R. 65 W., S. 11; northwest corner of; rock at section corner	1,603.6
T. 143 N., R. 65 W., S. 23; northwest corner of (ground)	1,539
T. 143 N., R. 65 W., S. 35; northwest corner of (ground)	1,542
T. 143 N., R. 65 W., S. 36; southwest corner of; rock at section corner	1,544.5
T. 143 N., R. 65 W., S. 31; southwest corner of; iron post marked "JMTN 1515"	1,514.751
T. 143 N., R. 66 W., S. 12; northeast corner of (ground)	1,585
T. 143 N., R. 66 W., S. 13; northeast corner of (ground)	1,514
T. 143 N., R. 66 W., S. 25; northeast corner of (ground)	1,515
T. 143 N., R. 66 W., S. 36; northeast corner of (ground)	1,510
T. 144 N., R. 62 W., S. 6; northwest corner of; iron post marked "JMTN 1507"	1,507.490
T. 144 N., R. 62 W., S. 7; northwest corner of; rock at road crossing	1,495.9
T. 144 N., R. 63 W., S. 19; northwest corner of; rock at road crossing	1,502.2
T. 144 N., R. 62 W., S. 30; northwest corner of (ground)	1,517
T. 144 N., R. 62 W., S. 31; northwest corner of; rock at road crossing	1,512.1
T. 144 N., R. 63 W., S. 19; northwest corner of; rock at road crossing	1,544.8
T. 144 N., R. 63 W., S. 30; northwest corner of; rock at road crossing	1,522.4
T. 144 N., R. 63 W., S. 31; northwest corner of (ground)	1,524
T. 144 N., R. 63 W., S. 31; southwest corner of; iron post marked "JMTN 1523"	1,522.739

	Feet.
Minneapolis, St. Paul and Sault Ste. Marie Railroad, top of rail, crossing of range line between ranges 63 and 64 W., T. 144 N	1,540
T. 144 N., R. 65 W., S. 2; northwest corner of	1,540.1
T. 144 N., R. 65 W., S. 14; northwest corner of (ground)	1,536
T. 144 N., R. 65 W., S. 23; northwest corner of; rock at section corner	1,526.1
T. 144 N., R. 65 W., S. 26; northwest corner of (ground)	1,537
T. 144 N., R. 65 W., S. 35; southwest corner of; iron post marked "JMTN 1574"	1,574.348
T. 144 N., R. 66 W., S. 1; northeast corner of; rock at section corner	1,564.6
T. 144 N., R. 66 W., S. 13; northeast corner of (ground)	1,561
T. 144 N., R. 66 W., S. 24; northeast corner of (ground)	1,573
T. 144 N., R. 66 W., S. 25; northeast corner of (ground)	1,579
T. 144 N., R. 66 W., S. 36; southeast corner of; iron post marked "JMTN 1605"	1,605.235
T. 145 N., R. 62 W., S. 6; northwest corner of; iron post marked "JMTN 1498"	1,497.996
T. 145 N., R. 62 W., S. 7; northwest corner of; rock at road crossing	1,497.4
T. 145 N., R. 62 W., S. 18; northwest corner of (ground)	1,502
T. 145 N., R. 62 W., S. 19; northwest corner of; rock at road crossing	1,513.2
T. 145 N., R. 62 W., S. 30; southwest corner of (ground)	1,503
T. 145 N., R. 62 W., S. 31; southwest corner of; rock at road crossing	1,501.9
T. 145 N., R. 63 W., S. 6; northwest corner of; iron post marked "JMTN 1522"	1,521.509
T. 145 N., R. 63 W., S. 30; northwest corner of; rock at road crossing	1,533
T. 145 N., R. 63 W., S. 31; southwest corner of; iron post marked "JMTN 1523"	1,523.393
T. 145 N., R. 64 W., S. 6; northwest corner of; iron post marked "JMTN 1526"	1,525.686
T. 145 N., R. 64 W., S. 7; northwest corner of; rock at road crossing	1,524.6
T. 145 N., R. 64 W., S. 18; northwest corner of; rock at road crossing	1,525.9
Minneapolis, St. Paul and Sault Ste. Marie Railroad, top of rail, road crossing in NE. ¼ sec. 19, T. 145 N., R. 64 W	1,511.2
T. 145 N., R. 64 W., S. 29; northwest corner of; rock at road crossing	1,519.1
T. 145 N., R. 64 W., S. 32; northwest corner of; rock at road crossing	1,516.8
T. 145 N., R. 64 W., S. 32; southwest corner of; iron post marked "JMTN 1526"	1,525.908
James River; water level at crossing of line between Foster and Stutsman counties	1,433
T. 145 N., R. 65 W., S. 5; northwest corner of; iron post marked "JMTN 1527"	1,527.126
T. 145 N., R. 65 W., S. —; Minneapolis, St. Paul and Sault Ste. Marie Railroad, top of rail, crossing of line between sections 5 and 6	1,540.9
T. 145 N., R. 65 W., S. 20; northwest corner of; rock at section corner	1,555
T. 145 N., R. 65 W., S. 29; northwest corner of; rock at section corner	1,565.3
T. 145 N., R. 65 W., S. 32; northwest corner of; rock at section corner	1,571.8
T. 145 N., R. 65 W., S. 32; southwest corner of; iron post marked "JMTN 1569"	1,569.172
T. 146 N., R. 62 W., S. 6; northwest corner of; iron post marked "JMTN 1475"	1,474.761
T. 146 N., R. 62 W., S. 7; northwest corner of; rock at road crossing	1,495.4
T. 146 N., R. 62 W., S. 18; northwest corner of (ground)	1,500
T. 146 N., R. 62 W., S. 18; ¼ corner, west side of	1,500.9
T. 146 N., R. 62 W., S. 19; southeast corner of (ground)	1,497
T. 146 N., R. 62 W., S. 31; northwest corner of (ground)	1,499
T. 146 N., R. 63 W., S. 2; northwest corner of; rock at road crossing	1,497.7

	Feet.
T. 146 N., R. 63 W., S. 3; northwest corner of (ground)	1,502
T. 146 N., R. 63 W., S. 4; northwest corner of (ground)	1,505
T. 146 N., R. 63 W., S. 5; near northwest corner of	1,520
T. 146 N., R. 63 W., S. 6; northwest corner of; iron post marked "JMTN 1497"	1,497.127
T. 146 N., R. 63 W., S. 18; northwest corner of; rock at road crossing	1,513.1
T. 146 N., R. 63 W., S. 30; northwest corner of; rock at road crossing	1,543.9
T. 146 N., R. 64 W., S. 6; northwest corner of; iron post marked "JMTN 1578"	1,578.112
T. 146 N., R. 64 W., S. 7; northwest corner of (ground)	1,524
T. 146 N., R. 64 W., S. 30; northwest corner of (ground)	1,526
T. 146 N., R. 64 W., S. 31; northwest corner of (ground)	1,523
T. 146 N., R. 65 W., S. 1; northwest corner of (ground)	1,574
T. 146 N., R. 65 W., S. 3; northwest corner of (ground)	1,530
T. 146 N., R. 65 W., S. 4; northwest corner of; rock at road crossing	1,527.4
T. 146 N., R. 65 W., S. 5; northwest corner of; iron post marked "JMTN 1521"	1,520.948
T. 146 N., R. 65 W., S. 8; northwest corner of (ground)	1,525
T. 146 N., R. 65 W., S. 17; northwest corner of (ground)	1,522
T. 146 N., R. 65 W., S. 20; northwest corner of (ground)	1,521
T. 146 N., R. 65 W., S. 29; northwest corner of; rock at section corner	1,523.2

WYOMING.

LARAMIE COUNTY.

PATRICK AND HARTVILLE QUADRANGLES.

The elevations in the following list are based on the bench mark established in the season of 1896 at Cheyenne—a bronze tablet on the top step in front of the State capitol building, marked 6101. (See Eighteenth Annual Report, Part I, p. 348.)

All bench marks set during the current season were marked "CHYN" in addition to the figures of elevation.

The leveling was done by Mr. M. C. McFarlane, levelman, under the general direction of Mr. John H. Renshawe, geographer.

	Feet.
T. 21 N., R. 60 W., S. 6; top of rock ¼ corner, north side of	4,201.1
T. 21 N., R. 60 W., S. 6; top of rock northeast corner of	4,202.6
T. 21 N., R. 60 W., S. 5; top of rock northeast corner of	4,213.4
T. 21 N., R. 60 W., S. 4; top of rock ¼ corner, north side of	4,225
T. 21 N., R. 60 W., S. 4; top of rock northeast corner of	4,212.7
T. 21 N., R. 60 W., S. 3; top of rock ¼ corner, north side of	4,240.5
T. 21 N., R. 60 W., S. 3; northeast corner of; boundary line between Wyoming and Nebraska; iron post marked "CHYN 4256"	4,256.210
T. 21 N., R. 60 W.; northwest corner of	4,339.5
T. 21 N., R. 61 W.; S. 6; top of ¼ corner rock, north side of	4,342.3
T. 21 N., R. 61 W.; S. 6; top of rock northeast corner of	4,351.6
T. 21 N., R. 61 W.; S. 5; top of rock ¼ corner, north side of	4,349.7
T. 21 N., R. 61 W.; S. 5; top of rock northeast corner of	4,337.5
T. 21 N., R. 61 W.; S. 4; top of rock ¼ corner, north side of	4,334.8
T. 21 N., R. 61 W.; S. 4; northeast corner of; iron post marked "CHYN 4318"	4,318.090
T. 21 N., R. 62 W. S. 1; ¼ corner, north side of (ground)	4,289

	Feet.
T. 21 N., R. 62 W., S. 1; top of rock northwest corner of	4,307.7
T. 21 N., R. 62 W., S. 2; top of rock ¼ corner, north side of	4,315.7
T. 21 N., R. 62 W., S. 2; top of rock northwest corner of	4,332.6
T. 21 N., R. 62 W., S. 3; top of rock ¼ corner, north side of	4,326.8
T. 21 N., R. 62 W., S. 3; northwest corner of; iron post marked "CHYN 4338"	4,338.346
T. 21 N., R. 62 W., S. 4; top of rock ¼ corner, north side of	4,375.1
T. 21 N., R. 62 W., S. 3; top of rock ¼ corner, north side of	4,303
T. 21 N., R. 62 W., S. 3; top of rock northeast corner of	4,250.9
T. 21 N., R. 62 W., S. 2; top of rock ¼ corner, north side of	4,224
T. 21 N., R. 62 W., S. 2; top of rock northeast corner of	4,250.6
T. 21 N., R. 62 W., S. 1; top of rock ¼ corner, north side of	4,251.5
T. 21 N., R. 62 W.; northeast corner of; iron post marked "CHYN 4225"	4,224.864
T. 21 N., R. 62 W., S. 4; top of rock northwest corner of	4,396.3
T. 21 N., R. 62 W., S. 5; top of rock ¼ corner, north side of	4,402.6
T. 21 N., R. 62 W., S. 5; top of rock northwest corner of	4,377.1
T. 21 N., R. 62 W., S. 6; northwest corner of; iron post marked "CHYN 4430"	4,430.068
T. 21 N., R. 63 W., S. 1; ¼ corner north side of	4,438.3
T. 21 N., R. 63 W., S. 1; top of rock northwest corner of	4,425.4
T. 21 N., R. 63 W., S. 2; top of rock ¼ corner, north side of	4,458.4
T. 21 N., R. 63 W., S. 2; top of rock northwest corner of	4,449.4
T. 21 N., R. 63 W., S. 3; top of rock ¼ corner, north side of	4,416.8
T. 21 N., R. 63 W., S. 3; northwest corner of; iron post marked "CHYN 4430"	4,430.189
T. 21 N., R. 63 W., S. 4; top of rock ¼ corner, north side of	4,479
T. 21 N., R. 63 W., S. 4; top of rock northwest corner of	4,499.5
T. 21 N., R. 63 W., S. 5; top of rock ¼ corner, north side of	4,542.4
T. 21 N., R. 63 W., S. 5; top of rock northwest corner of	4,496.1
T. 21 N., R. 63 W., S. 6; top of rock ¼ corner, north side of	4,485.2
T. 21 N., R. 63 W., S. 6; northwest corner of; iron post marked "CHYN 4515"	4,515.283
T. 22 N., R. 63 W., S. 31; top of rock ¼ corner, west side of	4,494.6
T. 22 N., R. 63 W., S. 31; top of rock northwest corner of	4,484.6
T. 22 N., R. 63 W., S. 30; top of rock ¼ corner, west side of	4,462
T. 22 N., R. 63 W., S. 30; top of rock northwest corner of	4,432
T. 22 N., R. 63 W., S. 19; top of rock ¼ corner, west side of	4,472.1
T. 22 N., R. 63 W., S. 19; northwest corner of; iron post marked "CHYN 4484"	4,483.771
T. 22 N., R. 63 W., S. 18; top of rock ¼ corner, west side of	4,561.2
T. 22 N., R. 63 W., S. 18; top of rock northwest corner of	4,529.9
T. 22 N., R. 63 W., S. 7; top of rock ¼ corner, west side of	4,513.1
T. 22 N., R. 63 W., S. 7; top of rock northwest corner of	4,447.6
T. 22 N., R. 63 W., S. 6; top of rock ¼ corner, west side of	4,445.3
T. 22 N., R. 63 W., S. 6; northwest corner of; iron post marked "CHYN 4420"	4,419.851
T. 23 N., R. 62 W., S. 6; northwest corner of; iron post marked "CHYN 4201"	4,201.253
T. 23 N., R. 62 W., S. 5; northwest corner of (ground)	4,190
T. 23 N., R. 62 W., S. 5; top of rock ¼ corner, north side of	4,205.1
T. 23 N., R. 62 W., S. 4; top of rock northwest corner of	4,190.5
T. 23 N., R. 62 W., S. 4; top of rock ¼ corner, north side of	4,181.6
T. 23 N., R. 62 W., S. 3; northwest corner of; iron post marked "CHYN 4177"	4,176.845
T. 23 N., R. 63 W., S. 31; ¼ corner, west side of (ground)	4,441

	Feet.
T. 23 N., R. 63 W., S. 6; top of rock ¼ corner, north side of	4,274.1
T. 23 N., R. 63 W., S. 5; top of rock ¼ corner, north side of	4,252.6
T. 23 N., R. 63 W., S. 4; top of rock northwest corner of	4,250.3
T. 23 N., R. 63 W., S. 4; top of rock ¼ corner, north side of	4,255.2
T. 23 N., R. 63 W., S. 3; northwest corner of; iron post marked "CHYN 4257"	4,257.411
T. 23 N., R. 63 W., S. 2; top of rock northwest corner of	4,243.9
T. 23 N., R. 63 W., S. 1; top of rock northwest corner of	4,215.3
T. 23 N., R. 63 W., S. 1; top of rock ¼ corner, north side of	4,209.7
T. 23 N., R. 63 W., S. 31; northwest corner of (ground)	4,361
T. 23 N., R. 63 W., S. 30; top of rock ¼ corner, west side of	4,354.8
T. 23 N., R. 63 W., S. 30; top of rock northwest corner of	4,343
T. 23 N., R. 63 W., S. 19; top of rock ¼ corner, west side of	4,331.1
T. 23 N., R. 63 W., S. 19; northwest corner of; iron post marked "CHYN 4315"	4,315.430
T. 23 N., R. 63 W., S. 18; top of rock ¼ corner, west side of	4,291.3
T. 23 N., R. 63 W., S. 18; top of rock northwest corner of	4,314.3
T. 23 N., R. 63 W., S. 7; top of rock ¼ corner, west side of	4,202.1
T. 23 N., R. 63 W., S. 7; top of rock northwest corner of	4,249.5
T. 23 N., R. 63 W., S. 6; top of rock ¼ corner, west side of	4,269.3
T. 23 N., R. 63 W., S. 6; northwest corner of; iron post marked "CHYN 4309"	4,309.393
T. 23 N., R. 64 W., S. 1; top of rock ¼ corner, north side of	4,335.6
T. 23 N., R. 64 W., S. 1; top of rock northwest corner of	4,302.5
T. 23 N., R. 64 W., S. 2; top of rock ¼ corner, north side of	4,314.5
T. 23 N., R. 64 W., S. 2; top of rock northwest corner of	4,383.2
T. 23 N., R. 64 W., S. 3; top of rock ¼ corner, north side of	4,360.2
T. 23 N., R. 64 W., S. 3; northwest corner of; iron post marked "CHYN 4360"	4,359.667
T. 23 N., R. 64 W., S. 4; top of rock ¼ corner, north side of	4,355.5
T. 23 N., R. 64 W., S. 4; top of rock northwest corner of	4,367.9
T. 23 N., R. 64 W., S. 5; top of rock ¼ corner, north side of	4,393.2
T. 23 N., R. 64 W., S. 5; northwest corner of (ground)	4,391
T. 23 N., R. 64 W., S. 6; top of rock ¼ corner, north side of	4,386.5
T. 23 N., R. 64 W., S. 6; northwest corner of; iron post marked "CHYN 4403"	4,402.585
T. 23 N., R. 65 W., S. 1; top of rock ¼ corner, north side of	4,424.6
T. 23 N., R. 65 W., S. 1; top of rock northwest corner of	4,442.6
T. 23 N., R. 65 W., S. 2; top of rock ¼ corner, north side of	4,468.6
T. 23 N., R. 65 W., S. 2; northwest corner of (ground)	4,500
T. 23 N., R. 65 W., S. 3; ¼ corner, north side of (ground)	4,534
T. 23 N., R. 65 W., S. 3; northwest corner of; iron post marked "CHYN 4599"	4,598.810
T. 24 N., R. 62 W., S. 6; northwest corner of; iron post marked "CHYN 4228"	4,228.215
T. 24 N., R. 62 W., S. 6; top of rock ¼ corner, north side of	4,248.5
T. 24 N., R. 62 W., S. 5; top of rock northwest corner of	4,225.8
T. 24 N., R. 62 W., S. 4; top of rock northwest corner of	4,165.4
T. 24 N., R. 62 W., S. 4; top of rock ¼ corner, north side of	4,143.6
T. 24 N., R. 62 W., S. 3; northwest corner of; iron post marked "CHYN 4133"	4,133.486
T. 24 N., R. 63 W., S. 3; top of rock ¼ corner, north side of	4,441.5
T. 24 N., R. 63 W., S. 2; top of rock northwest corner of	4,370.9
T. 24 N., R. 63 W., S. 2; top of rock ¼ corner, north side of	4,317
T. 24 N., R. 63 W., S. 1; northwest corner of (ground)	4,290

	Feet.
T. 24 N., R. 63 W., S. 1; top of rock ¼ corner, north side of	4,251.9
T. 24 N., R. 63 W., S. 6; ¼ corner, north side of (ground)	4,723
T. 24 N., R. 63 W., S. 5; top of rock northwest corner of	4,692.5
T. 24 N., R. 63 W., S. 5; top of rock ¼ corner, north side of	4,578
T. 24 N., R. 63 W., S. 4; top of rock northwest corner of	4,606.9
T. 24 N., R. 63 W., S. 4; top of rock ¼ corner, north side of	4,454.3
T. 24 N., R. 63 W., S. 3; northwest corner of; iron post marked "CHYN 4443"	4,443.481
T. 24 N., R. 63 W., S. 31; top of rock ¼ corner, west side of	4,298.5
T. 24 N., R. 63 W., S. 31; top of rock northwest corner of	4,276.3
T. 24 N., R. 63 W., S. 30; top of rock ¼ corner, west side of	4,287.2
T. 24 N., R. 63 W., S. 19; ¼ corner west side of (ground)	4,315
T. 24 N., R. 63 W., S. 19; northwest corner of; iron post marked "CHYN 4346"	4,346.691
T. 24 N., R. 63 W., S. 18; top of rock northwest corner of	4,382.8
T. 24 N., R. 63 W., S. 7; top of rock northwest corner of	4,498.1
T. 24 N., R. 63 W., S. 6; top of rock ¼ corner, west side of	4,540.7
T. 24 N., R. 63 W., S. 6; northwest corner of; iron post marked "CHYN 4655"	4,655.353
T. 24 N., R. 64 W., S. 1; ¼ corner, north side of (ground)	4,616
T. 24 N., R. 64 W., S. 1; northwest corner of (ground)	4,617
T. 24 N., R. 64 W., S. 2; top of rock northwest corner of	4,575.8
T. 24 N., R. 64 W., S. 3; ¼ corner, north side of (ground)	4,570
T. 24 N., R. 64 W., S. 4; ¼ corner, north side of (ground)	4,678
T. 24 N., R. 64 W., S. 4; northwest corner of; iron post marked "CHYN 4694"	4,694.082
T. 24 N., R. 65 W., S. 2; ¼ corner north side of; iron post marked "CHYN 4930"	4,930.075
T. 24 N., R. 65 W., S. 2; top of rock northwest corner of	4,946.2
T. 24 N., R. 65 W., S. 4; top of rock northwest corner of	4,978.3
T. 24 N., R. 65 W., S. 5; top of rock ¼ corner, north side of	4,981.9
T. 24 N., R. 65 W., S. 5; top of rock northwest corner of	4,995.7
T. 24 N., R. 65 W., S. 6; ¼ corner north side of; iron post marked "CHYN 5032"	5,031.558
Eagles Nest, 270 feet northeast from intersection of roads; iron post marked "CHYN 5011"	5,010.668
Old road to Laramie River (abandoned), on west side of, 650 feet south from crossing of Eagles Nest Creek bed; iron post marked "CHYN 4687"	4,686.640
T. 24 N., R. 66 W., S. 12; ¼ corner west side of (ground)	4,750
T. 24 N., R. 66 W., S. 10; 2,800 feet southeast from northwest corner of, west side Chugwater road; iron post marked "CHYN 4552"	4,551.811
T. 24 N., R. 66 W., S. 10; south of north boundary of; bed of Chugwater Creek	4,523
Wheatland depot, Cheyenne and Northern Railroad, base of rail east side of; iron post marked "CHYN 4737"	4,737.402
T. 25 N., R. 63 W., S. 30; top of rock ¼ corner, west side of	4,509.3
T. 25 N., R. 63 W., S. 30; top of rock northwest corner of	4,517.6
T. 25 N., R. 63 W., S. 19; northwest corner of; iron post marked "CHYN 4376"	4,376.251
T. 25 N., R. 63 W., S. 6; northwest corner of; iron post marked "CHYN 4211"	4,211.225
T. 25 N., R. 63 W., S. 31; top of rock ¼ corner, west side of	4,795.0
T. 25 N., R. 63 W., S. 31; northeast corner of (ground)	4,762
T. 26 N., R. 63 W., S. 31; ¼ corner west side of (ground)	4,208
T. 26 N., R. 64 W., S. 28; northwest corner of, Old Fort Laramie; iron post marked "CHYN 4263"	4,262.547

ROCKY MOUNTAIN SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. E. M. Douglas, geographer in charge, eight leveling parties were engaged at various times during the year in running lines of spirit levels for the control of the topographic work being executed in the various localities.

SOUTH DAKOTA; BLACK HILLS.

CUSTER, PENNINGTON, LAWRENCE, AND MEADE COUNTIES

DEADWOOD, HERMOSA, RAPID, AND HARNEY PEAK QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the City Hall building at Deadwood and marked "4543" feet, and all bench marks dependent upon this datum are stamped with the letters "DW" The initial elevation on which this work depends is the Fremont, Elkhorn and Missouri Valley Railroad Company's bench mark on the water table at the northwest corner of the City Hall. Based on the elevation of this bench mark—4,544.73 feet—the elevation of the central datum at Deadwood is accepted as 4,543.472 feet above mean sea level.

The leveling was done, under the general direction of Mr. A. F. Dunnington, topographer, by Messrs. J. C. Barber and J. T. Stewart, level men, except that from Tilford to Deadwood and in the vicinity of Deadwood, which was done by L. F. Gottschalk, under the direction of W. H. Herron, topographer.

DEADWOOD.

	Feet.
Deadwood, city hall, north entrance, bronze tablet in stone lintel on west side of door marked "DW 4543"	4,543.472
Deadwood, city hall, top of water table, under window, northwest corner of building, 2 feet east of corner stone	4,544.72
Deadwood, Fremont, Elkhorn and Missouri Valley Railroad depot, top of rail	4,531.5
Deadwood, Smith building, portions occupied by post-office, north side of Deadwood avenue, east side of Deadwood Creek, bronze tablet set in south face of southeast corner of building marked "DW 4535"	4,535.241
Deadwood, Burlington and Missouri River Railroad depot, top of west rail in front of ticket office	4,533.3

DEADWOOD TO HOT SPRINGS VIA BURLINGTON AND MISSOURI RIVER RAILROAD.

Pluma, ¼ mile north of; spike in Burlington and Missouri River Railroad telegraph pole, 2½ feet above ground, pole between two white posts marked "Pluma" and "Yard Limit"	4,674.07
Pluma, top of end of frog of branch railroad to Lead City	4,716.3
Pluma, highway bridge over Whitewood Creek, on wagon road to Lead City, top of head of large bolt in foot of brace at southeast corner of bridge	4,720.67
Pluma, ¼ mile south of; 500 feet south of schoolhouse, on opposite side of road from old log cabin, spike near ground in corner fence post	4,773.31
Pluma, 1 mile south of; bridge No. 122, 20 feet from south end, wire nail in top of east end of cap	4,833.06

	Feet.
Kirk, ¼ mile north of; 150 feet south of railroad whistling post, 200 feet north of road crossing, spike 2 inches above ground in northwest side of telegraph pole	4,904.82
Kirk, top of rail in front of Burlington and Missouri River Railroad station	4,989.3
Kirk, 150 feet west of Burlington and Missouri River Railroad station; 45 feet southwest of railroad tracks, 15 feet north of wagon road, 30 feet southwest of telegraph pole, in top of north side quartzite rock 3 by 2 feet, copper bolt marked "DW 4990"	4,989.884
Kirk, 1¼ miles south of; bridge No. 118, south bent, wire nail in top of east end of cap	5,139.23
Kirk, 1¾ miles south of; bridge No. 116, south bent, wire nail in top of east end of cap	5,263.99
Kirk, 2¼ miles south of; deep rock cut near stone quarry, east side of railroad tracks, 25 feet south of north end of cut, top of small projection in niche on face of rock wall, 3 feet above rails	5,323.52
Englewood, 1¼ miles north of; 60 feet south of wagon-road crossing, cross on a flat rock	5,421.71
Englewood, 1 mile north of; bridge No. 114, center bent, wire nail in top of west end of cap	5,470.26

Englewood to Rockford.

Englewood, ¼ mile north of; 100 feet south of crossing of Black Hills and Fort Pierre Railroad over Burlington and Missouri River Railroad, 30 feet east of Burlington and Missouri River Railroad, large rock 15 by 15 by 10 inches; bronze tablet in top of center marked "DW 5537"	5,536.986
Englewood, top of rail in front of Burlington and Missouri River Railroad station	5,591
Englewood, bridge No. 112, center bent, wire nail in top of east end of cap.	5,593.28
Englewood, ½ mile south of; 35 feet east of track, 220 feet south of cattle guard, west side of center of ledge of light rock, cross on flat stone just south of rock mound	5,672.75
Englewood, ¾ mile south of; bridge No. 111, north bent, wire nail in top of east end of cap	5,708.39
Englewood, 1¼ miles south of; center of rock cut, 20 feet high on east side of track, 350 feet south of whistling post, cross on top of rock 2½ feet above tracks	5,839.43
Englewood, 2¼ miles south of; top of frog of switch to limestone quarry..	5,939.2
Englewood, 2¼ miles south of; 60 feet southwest from switch to limestone quarry, spike in southwest side of post, in angle in snow fence, 1½ feet above ground	5,940.25
Englewood, 2¾ miles south of; ½ mile southeast of switch to limestone quarry in abandoned borrow pit; 35 feet north of track, cross on top of stone 5 feet long and 1½ feet high, near telegraph pole	6,016.07
Dumont, 1½ miles north of; 60 feet southwest of road crossing, 5 feet south of wagon road, 30 feet from track, spike in stump	6,093.69
Dumont, ¾ mile north of; 60 feet west of wagon-road crossing, 10 feet east of wagon road running north and south; iron post marked "DW. 6178".	6,178.342
Dumont, top of east rail, opposite frog in switch, in front of section house.	6,148.9
Dumont, 1,000 feet south of; 50 feet east of track at road crossing, 10 feet of wagon road; spike in north side of stump near ground	6,133.85
Dumont, 1.2 miles southeast of; 1,200 feet southeast of log house, 20 feet northeast of wagon road, 250 feet southwest of track; spike in top of large stump near bottom of draw	6,018.16
Bulldog Ranch, about 1 mile north of; 500 feet north of abandoned sawmill site, 5 feet east of county road; wire nail in root of pine tree	5,951.81

	Feet.
Bulldog Ranch, 75 feet east of track; 50 feet northwest from wagon road, 15 feet southwest of post in mound of rock, marked "U.S.L.M. 73;" bronze tablet set in top of small flat rock, marked "DW. 5863"	5,862.998
Bulldog Ranch, 1 mile south of; 15 feet southeast of bridge No. 105, corner fence post between railroad and wagon road; bent drift bolt in southwest corner near ground	5,760.93
Nahant, 1 mile north of; bridge No. 103, south; bent spike in top of east end of cap	5,688.89
Nahant, 1,000 feet north of; fence post at northeast corner of bridge No. 101; spike in northwest side near ground	5,637.41
Nahant, ¼ mile south of; 200 feet west of track, 30 feet southwest of wagon road, in northwest side of rock quarry, 14 feet above wagon road; copper bolt marked "DW, 5604"	5,604.221
Nahant, 1.6 miles south of; west of bridge No. 98; bent nail in top of west end of cap, 2 feet from end	5,520.71
Nahant, 3.3 miles south of; southwest end of tunnel, outside brace on east side of track; spike in top 1 foot above ground	5,466.26
Rochford, 1.6 miles northwest of; 2,000 feet north of junction of North and South Rapid creeks, 240 feet north of bridge No. 92, rock cut on east side of track, 100 feet from south end of cut; cross on rock near ground.	5,381.68
Rochford, 1.2 miles west of; junction of North and South Rapid creeks, 200 feet west of track, 10 feet north of wagon road, 40 feet southeast of stream, rock 7 by 7 by 6 feet; small cross on north side 2½ feet above ground	5,361.38
Rochford, 3,000 feet west of; 30 feet east of road crossing, cattle guard on north side of track; spike in top of center post a few inches above top of rail	5,328.13
Rochford, west end of town; county road crossing; cattle guard on south side of track, 40 feet east of road; wire nail in top of center post, 200 feet west of bridge No. 89	5,276.66
Rochford, west end of town; 30 feet north of junction of road along north bank of Rapid Creek with road from Hill City; rock outcrop on point about 22 feet above track, 2 feet south of rock mound; copper bolt marked "DW. 5299"	5,299.008
Rochford railroad station, 300 feet west of; 10 feet north of track, 15 feet northeast of northeast corner of planking in road crossing, 1 foot from small mound of rock; projection in face of rock cut 1 foot above ground	5,227.64
Rochford station, 300 feet west of; top of rail, county road crossing	5,227.2

Rockford to Hill City.

Rochford station, 1 mile southeast of; 6 feet west of signpost marked "Rochford;" wire nail in top of "P. C." reference post	5,153.04
Rochford station, 2 miles southeast of; 100 feet north of track, 10 feet north of wagon road, opposite whistling post; wire nail in root of large pine tree	5,084.30
Rochford station, 3 miles southeast of; 300 feet northeast of road crossing, in cut 8 feet east of whistling post, north side of track; tack in top of "P. T." reference post	5,031.55
Rochford station, 3½ miles southeast of; 100 feet northeast of bridge No. 79, 150 feet southeast of fork in wagon road, 25 feet northeast of road, in top of northwest one of two large slate rocks; copper bolt marked "DW. 4970"	4,970.038
Rochford station, 4½ miles southeast of; 220 feet southeast of bridge No. 77, 8 feet southwest of track; projection in wall of rock cut 1½ feet above tracks	4,899.02
Mystic, 3 miles north of; south end of tunnel, 2 feet from west wall; spike in top of mudsill, 2 inches above ditch	4,850.98

	Feet.
Mystic, 1¼ miles northeast of; 600 feet east of mill, 100 feet south of west end of bridge No. 74, 75 feet west of wagon road on bank of Castle Creek; spike in root on south side of pine stump 4 feet high	4,812.81
Mystic, 3,500 feet northeast of; 300 feet south of signpost marked "Mystic," 40 feet west of track, 20 feet west of wagon road; wire nail in root of large spruce tree	4,828.74
Mystic, 1,500 feet west of sawmill near section house, 400 feet northeast of post-office, 100 feet northwest of wagon road, 200 feet northwest of tracks; rock outcrop on point, in east corner, 7 feet above foot of outcrop; copper bolt marked "DW. 4865"	4,865.325
Mystic, 1¼ miles southwest of; north end of tunnel, west side, spike in top of mudsill, 1½ feet east of foot of middle batter brace	5,031.49
Mystic, 2½ miles southwest of; northeast end of tunnel, 8 feet southwest of east corner; wire nail in top of "P. S." reference post	5,137.12
Mystic, 2.6 miles southwest of; 2,200 feet southwest of tunnel, center of high rock cut on east side of a 10 degree curve, 150 feet east of wagon road, 8 feet east of and 6 inches above tracks; spike in vertical seam in rock	5,207.51
Mystic, 3½ miles southwest of; 1½ miles north of top of divide between Slate and Castle creeks, 15 feet west of track, 120 feet northeast of wagon road, 250 feet southeast of gate in plank fence around cow pen, 500 feet east of house, large black stump at southeast end of cut; spike in east side 3 inches above ground	5,306.71
Mystic, 4½ miles southwest of; north end of divide between Castle and Slate creeks, 3,500 feet northwest of bridge No. 68 over Slate Creek, 350 feet south of garden patch, 15 feet east of wagon road, 30 feet west of track, 50 feet southwest of "P. T." post, 30 feet north of end of waste dump; iron post marked "DW. 5514"	5,514.064
Slate Creek, top of rail on bridge No. 68, about 50 feet above creek and wagon road	5,473.4
Redfern, 3,000 feet north of; 150 feet southeast of log dwelling, 40 feet west of track; spike in north side of stump of wind-broken pine tree	5,538.99
Redfern, 400 feet north of section house, 15 feet west of track at north end of cut; spike in east side of pine stump	5,623.33
Redfern, top of road crossing at section house	5,631
Redfern, 3,000 feet south of; 50 feet south of wood road crossing west side of track; wire nail in top of "P. S." reference post	5,623.14
Redfern, 1 mile southeast of; 200 feet southwest of signpost marked "Redfern," 60 feet southwest of small bridge in wagon road; spike in top of large pine stump	5,574.47
Redfern, 1½ miles southeast of; southeast end of group of log houses, 15 feet northeast of track at west end of a slate waste dump; spike in root of west side of pine stump	5,518.85
Redfern, 2.6 miles southeast of; 75 feet east of crossing of Rochford and Hill City wagon road, 1,000 feet north of dwelling between bridges 61 and 62; spike in northeast side of pine tree	5,435.32
Hill City, 4.3 miles northwest of; 900 feet north of bridge No. 60, 3,000 feet east of county road crossing, 300 feet north of spring in meadow, 400 feet west of house, 30 feet north of wagon road from Redfern to Hill City, in east side of rock outcrop, 10 feet above road, 3 feet north of small rock mound; copper bolt marked "DW. 5349"	5,349.106
Hill City, 3.3 miles northwest of; 600 feet west of house; wire nail in top of "P. S." reference post	5,264.99
Hill City, 3 miles northwest of; 200 feet east of bridge No. 58 over wagon road, 15 feet north of road; spike in south side of telegraph pole	5,235.23

	Feet.
Hill City, 2 miles northwest of; 250 feet east of bridge No. 56, 12 feet south of wagon road; spike in northeast side of telegraph pole	5,125.68
Hill City, 1¼ miles northwest of; 10 feet northeast of gate in railroad fence, 300 feet southwest of bridge on wagon road; spike in southwest side of telegraph pole	5,054.10
Hill City, ¾ mile northwest of; crossing of Hill City and Rochford wagon road over railroad, west cattle guard, south side track; large wire nail in top of small center post	5,021.97
Hill City, 120 feet south of station; in center of south end of lawn, 2 feet north of fence; iron post marked "DW 4976"	4,976.314
Hill City, south end of town; 3,600 feet south of station, 75 feet east of track, 500 feet north of switch on branch line to Coats and Cowboy, 75 feet south of old abandoned sawmill; bronze tablet in top of white quartz rock, 2 by 2 feet at surface, marked "DW 5026"	5,026.204

Hill City to Custer.

Hill City, 1.4 miles south of; northwest corner bridge No. 49; bent spike in fence post 1 foot below top of rail	5,057.78
Hill City, about 2 miles south of; cattle guard on south side of abandoned road crossing midway between two deep cuts 1,000 feet apart; copper nail in top of center post 2 feet west of and 6 inches above track	5,097.34
Hill City, 2.4 miles south of; cattle guard on south side of road crossing; bent copper nail in center post 2 feet west of and a few inches above track	5,117.68
Lumber Spur, 6 feet south of switch stand; northeast corner of bridge No. 44; spike in west side of fence post 10 feet above stream	5,176.74
Hill City, 4 miles south of; 1 mile southwest of switch at Lumber Spur, 470 feet northeast of crossing of Hill City and Custer wagon road, 235 feet southwest of southwest end of bridge No. 42, 100 feet north of limit post between railroad sections 10 and 9, about center of rock cut, 10 feet west of and 6 inches above track; top of rock projecting from main wall of cut; copper bolt marked "DW 5240"	5,240.137
Orrville, 2,000 feet north of; bridge No. 40, second bent from south end; copper nail in top of west end of cap	5,304.84
Orrville; 25 feet northwest of track, 25 feet west of mail-bag catcher stand, 60 feet north of switch stand at north end of siding point marked ⊣⊢ on top of flat bowlder east of small rock mound	5,336.91
Orrville; 2,500 feet south of sawmill, 200 feet southeast of junction of Spring and Tenderfoot creeks, 250 feet south of crossing of Hill City and Custer wagon road, 100 feet west of bridge No. 37; copper nail in north side of pine tree, near ground	5,364.90
Orrville, 1.6 miles south of; 350 feet north of bridge No. 35; copper nail in top of "P. C." post	5,505.93
Orrville, 2 miles south of; 1,400 feet south of bridge No. 34, 500 feet east of abandoned sawmill site, 1,000 feet east of Hill City and Custer wagon road, 25 feet southeast of timber road crossing, 10 feet east of and 1 foot above track; copper nail in root southwest side of large pine stump	5,591.16
Custer, 6 miles northwest of; 1,000 feet north of tin mine, 500 feet northeast of Tenderfoot Springs, long rock cut in curve on east side of track, white quartz rock 2 by 2 foot face on top of south end of cut; copper bolt in top, marked "DW 5696"	5,695.853
Custer, 5 miles northwest of; north end of cut on top of divide between Orrville and Custer, 60 feet southeast of county road crossing (Hill City–Custer); spike in west side of telegraph pole, ½ foot above ground.	5,825.06

	Feet.
Berne Siding; 200 feet southeast of northwest switch stand, 40 feet southeast of road crossing; spike in north side of telegraph pole, 3 feet above track	5,854.51
Custer, 3½ miles northwest of; 250 feet north of crossing of Hill City and Custer wagon road, 50 feet east of road, in center of quartz outcrop, 1 foot south of loose rock mound; bronze tablet in top of rock, 2 by 2 foot surface, marked "DW5749"	5,749.320
Custer, 2 miles north of; 1,000 feet southwest of abandoned sawmill site, 100 feet north of north end cut; copper nail in top of white "P. S." reference post	5,540.69
Custer, 1½ miles north of; northwest corner bridge No. 29; spike in fence post	5,439.27
Custer; water tank, north bent of support; copper nail in top of west end of sill, 2 feet above ground	5,303.21
Custer; top of rail main track in front of ticket office	5,303.
Custer; 950 feet southwest of station, 440 feet south of track, 500 feet east of axle-grease factory, north side of group of rocks, 5 feet east of large blazed pine tree, 1 foot north of rock mound; bronze tablet in top of rock, 5 by 5 foot surface, 5 feet high on lower side, marked "DW 5322".	5,322.265

Custer to Pringle.

Custer, 1.2 miles south of; 100 feet east of track on inside of curve, on opposite side of track from large jagged rock, pine tree at west end of rock ledge; copper nail in root on west side of tree	5,373,43
Custer, 1.8 miles south of; 900 feet south of log house, north of yellowish brown house, 20 feet west of white reference post marked "P. S. 10°," north end of large rock in cut on west side of track, ⋈ chiseled around point	5,425.19
Custer, 2.3 miles south of; crossing Custer and Pringle wagon road over railroad, cattle guard south side of wagon road, east side of railroad; spike in small post at south end, 2 feet from and 3 inches below rail	5,474.16
Custer, 2.7 miles south of; ¼ mile south of top of divide, 85 feet northeast of Custer and Pringle road crossing over railroad, 800 feet north of log house, 25 feet east of wagon road, 2 feet southwest of rock mound; copper bolt in rock 4 by 10 by 2 feet high, marked "DW 5469"	5,469.252
Custer, 3.7 miles south of; 2,000 feet south of abandoned sawmill site at county-road crossing, 200 feet north of farm-road crossing, 100 feet east of large rock (50 feet high) on northwest side of railroad; copper nail in top of railroad reference post ("P. S. 6°") on southeast side of track	5,397.41
Mayo, 1½ miles north of; road crossing at small settlement, cattle guard north side of wagon road, west side of track; copper nail in top of small oak center post, about level with and 2 feet from rail	5,267.53
Mayo; 175 feet north of railroad section house, 75 feet northeast of road crossing, rock 100 by 30 feet, 25 feet high, near southwest corner, 6 feet above ground; copper bolt marked "DW 5190"	5,190.082
Mayo, 1 mile south of; 50 feet northeast of north corner bridge No. 16; spike in east side of corner fence post, 1 foot above ground	5,111.73
Pringle, about 3 miles north of; Custer and Pringle road crossing over railroad, 40 feet south of road, 50 feet east of track; spike in north side of fence post, 3 inches above ground	5,078.90
Pringle, 2 miles north of; 100 feet north of farm-road crossing, 500 feet southeast of barn, with weather vane; spike in east side of telegraph pole, 4 inches above ground	4,957.78
Pringle, 1 mile north of; 100 feet southeast of bridge No. 14, 50 feet east of farm-road crossing; spike in east side of telegraph pole 4 inches above ground	4,917.54

	Feet.
Pringle; 3,000 feet northeast of station, 300 feet south of Custer and Hot Springs road crossing over railroad, 250 feet north of whistling post marked "Pringle," 30 feet west of track, rock 100 by 30 feet, 20 feet high, in south side, 4 feet above ground; copper bolt marked "DW 4879"	4,878.955
Pringle; top of rail main track, in front of ticket office	4,879
Pringle; 1,100 feet southwest of station, cattle guard 70 feet southwest of road crossing; copper nail in top of small center post, 2 feet southeast of and a few inches above rail	4,885.39

Pringle to Minnekahta.

Pringle, 1 mile southwest of; 40 feet south of road crossing near top of divide, 3 feet northeast of telegraph pole, point on southwest corner of limestone rock marked ⋈	4,950.49
Loring siding, 6,000 feet north of north switch stand, 180 feet west of crossing Pringle and Minnekahta road, 280 feet northwest of bridge No. 11, limestone rock 20 by 15 feet, 5 feet high, 15 feet northwest of pine tree; copper bolt in top, 3 feet from northwest corner marked "DW 4697"	4,697.125
Loring siding, 90 feet southeast of south switch stand, 50 feet northeast of county road crossing; spike in northeast side of telegraph pole, 4 inches above ground	4,680.11
Loring siding, about 1 mile south of; near north end of deep cut on top of divide, 50 feet northeast of cattle guard; spike in north side of corner fence post, 8 inches above ground	4,829.30
Argyle, top of rail in front of section house	4,793.8
Argyle, 1,550 feet southwest of section house, 30 feet east of track, near north end of small cut, southeast end of sandstone rock 8 by 3 feet; copper bolt, 2 inches above ground, marked "DW 4798"	4,798.260
Argyle, 2 miles southwest of; 200 feet southeast of south end of a long line of snow fences, north of fill at head of gulch running southeast; spike in east side of telegraph pole	4,672.52
Ivanhoe siding, 1¼ miles east of; 100 feet southeast of road crossing; spike in north side of telegraph pole, 3 inches above ground	4,569.40
Ivanhoe siding, 2,000 feet northeast of; 60 feet southeast of crossing of Pringle and Minnekahta road, 10 feet northeast of corner fence post; iron post marked "DW 4443"	4,443.194
Minnekahta, 2½ miles north of; 50 feet northeast of cattle guard at north end of long tangent; spike in northeast side of corner fence post, 1 foot above ground	4,326.22
Minnekahta, about 1 mile north of; 40 feet east of road crossing at north end of series of snow fences; spike in south side of telegraph pole, 1 foot above ground	4,237.96
Minnekahta, top of rail in front of station	4,161.4

Minnekahta to Hot Springs.

Minnekahta, 800 feet northeast of station, 100 feet northeast of switch stand at east end of Y, 50 feet north of track, 5 feet southeast of corner fence post; iron post marked "DW 4159"	4,159.163
Minnekahta, 1.6 miles east of; cattle guard east side of road crossing, south side of railroad; copper nail in top of small center post	4,143.35
Minnekahta, 3½ miles east of; 850 feet east of road crossing, 40 feet north of track, 16 feet east of north-and-south wire fence; iron post marked "DW 4061"	4,061.107
Minnekahta, 4½ miles east of; cattle guard on east side of road crossing, south side of track; copper nail in top of small oak center post	4,022.13

	Feet.
Minnekahta, about 5 miles east of; south side of road crossing at west end long snow fence; spike in south side of east gate post, 6 inches above ground	3,987.49
Erskine siding, about 1 mile west of; cattle guard southwest side of road crossing southeast side of track; copper nail in top of small center post.	3,911.79
Erskine siding; top of rail, road crossing at platform	3,815.2
Erskine siding, 2,500 feet northeast of; 150 feet northwest of crossing Minnekahta and Hot Springs road, near bridge No. 5, 30 feet north of wagon road at nearest point, 2 feet south of rock mound; copper bolt in top of south corner of limestone ledge marked "DW 3794"	3,794.185
Erskine siding, 1.6 miles east of; 40 feet northwest of crossing of Erskine and Hot Springs road; spike in north side of corner fence post, 1 foot above ground	3,741.40
Hot Springs, about 4 miles west of; 30 feet northeast of crossing of Erskine and Hot Springs road; spike in north side of corner fence post, 9 inches above ground	3,699.96
Hot Springs, 2.8 miles west of; 220 feet east of bridge No. 7, cattle guard east side of road crossing, south of track; copper nail in top of small center post	3,657.31
Hot Springs, 1.8 miles west of; 60 feet west of road crossing, near small brown house; spike in south side of corner fence post, 2 inches above ground	3,590.78
Hot Springs, 1 mile west of; 30 feet west of road crossing, 2 feet south of track; copper nail in top of center post	3,521.47
Hot Springs, county court-house, south entrance, 2½ feet east of steps, 2½ feet above ground; bronze tablet in vertical face of wall marked "DW 3462"	3,462.169
Hot Springs, top of rail in front of Union Depot	3,443.4

HOT SPRINGS, VIA BUFFALO GAP, TO WHITEWOOD; FREMONT, ELKHORN AND MISSOURI VALLEY RAILROAD.

Hot Springs to Buffalo Gap.

Hot Springs, top of rail in front of station	3,427.8
Hot Springs, 400 feet south of old station, 100 feet west of main track; spike in west side of telegraph pole, 3 inches above ground	3,425.39
Hot Springs, 3,500 feet southeast of old station, 60 feet northwest of road crossing; spike, 6 inches above ground, in south side of large telegraph pole near corner of fence	3,399.16
Hot Springs, "Old Town," 130 feet north of station; spike in northeast side of telegraph pole	3,386.15
Hot Springs, 1.8 mile east of; ¼ mile east of large water wheel 15 feet north of cattleguard; spike in north side of white fence post	3,347.10
Hot Springs, 2.3 miles southeast of; 100 feet southwest of track, 300 feet south of bridge $\left(\frac{\text{H. S.}}{23}\right)$, 150 feet southwest of wagon road, sandstone rock 20 by 10 feet, 4 feet high; copper bolt in northeast end, marked "DW 3313"	3,313.350
Evans Quarry, 1 mile west of; 75 feet east of county road crossing, 8 feet north of cattle guard; spike in north side of white fence post, 4 inches above ground	3,265.25
Evans Quarry, 450 feet north of post-office, 200 feet north of fall in Fall River, 550 feet east of bridge $\left(\frac{\text{H. S.}}{17}\right)$, 50 feet north of and about 15 feet above track, irregular sloping rock 10 by 3 feet, 3 feet high; copper bolt 2 feet south of north end marked "DW 3225"	3,225.129

	Feet.
Evans Quarry, 1.3 miles northeast of; 250 feet northeast of road crossing, 50 feet north of culvert (H. S. 15½); spike in northwest side of telegraph pole, 4 inches above ground	3,294.05
Evans Quarry, 1.8 miles northeast of; 40 feet northwest of bridge (H. S. 15), 15 feet southwest of telegraph pole, 2 feet south of rock mound; ⋈ on top of small rock, 2 by 1 foot, 1 foot out of ground	3,339.68
Evans Quarry, 2.6 miles northeast of; county road crossing, 10 feet west of railroad at cattle guard; spike in south side of white fence post	3,352.97
Buffalo Gap, 5 miles southwest of; 1,000 feet southwest of section house, 60 feet west of county road crossing, 25 feet southeast of northeast end of snow fence; iron post marked "DW 3315"	3,315.302
Buffalo Gap, about 4 miles southwest of; 40 feet south of mileboard (H. S. 4); spike in west side of telegraph pole, 6 inches above ground	3,323.05
Elm Creek Siding, water tank; + cut on top of east end of masonry foundation for south bent of timber support	3,359.07
Buffalo Gap, 2 miles southwest of; 290 feet west of county road crossing, 30 feet south of county road, 1½ feet south of stone marking northwest corner of T. 7 S., R. 7 E.; iron post marked "DW 3410"	3,410.317
Buffalo Gap, 1½ miles southwest of; 50 feet northwest of road crossing; spike in north side of white corner fence post, 1 foot above ground	3,347.66
Buffalo Gap, top of rail main track in front of station	3,257.4
Buffalo Gap, 120 feet east of ticket office in station, 150 feet north of wagon road running along south side of Sec. 29, T. 6 S., R. 7 E.; iron post marked "DW 3258"	3,258.185

Buffalo Gap to Fairburn.

Beaver Creek, top of rail on bridge, 15 feet above stream	3,258.7
Buffalo Gap, 1¼ miles north of; 35 feet north of county-road crossing, 8 feet west of track; spike in east side of inclined post on south side of cattle guard, 6 inches below top of rail	3,325.57
Sec. 20, T. 6 S., R. 7 E.; 650 feet southwest of northeast corner stone, 10 feet west of track; spike in south side of fence post at west end of cattle guard	3,346.57
Buffalo Gap, 3.3 miles northeast of; 600 feet southwest of mile board 54; spike in northwest side of telegraph pole, 2 inches above ground	3,297.80
Buffalo Gap, 4.2 miles northeast of; 350 feet northeast of bridge (H 112), 200 feet southeast of track, 100 feet southeast of wagon road, 2½ feet east of fence corner post; iron post marked "DW 3265"	3,265.205
Buffalo Gap, 5.7 miles north of; north bent of bridge (H 116); copper nail in top of west end of cap	3,282.34
Buffalo Gap, 6¾ miles north of; 1,500 feet northwest of section house, 50 feet southwest of road crossing; spike in west side of fence corner post.	3,333.56
Melvin siding, 180 feet south of; north switch stand, west end of masonry culvert (H 121); bronze tablet in top of southwest corner of coping stone, marked "DW 3396"	3,396.335
Melvin siding, 1 mile north of; 80 feet east of abandoned county-road crossing and cattle guards; spike in northeast side of fence corner post, 6 inches above ground	3,458.10

Feet.

Sec. 4, T. 5 S., R. 7 E.; 675 feet east of and 30 feet north of south quarter corner, 700 feet north of section house No. 10, 60 feet west of track, 40 feet east of county road; iron post marked "DW 3604"..... 3,604.176

Fairburn, 3.6 miles southwest of; 500 feet southeast of house, 100 feet west of track, 10 feet west of junction of two wagon roads; fence post at southeast corner of field; spike in northeast side, 4 inches above ground. 3,514.73

Fairburn, 2½ miles southwest of; 1,190 feet south of east quarter corner of sec. 27, T. 4 S., R. 7 E., 3 feet northwest of railroad fence, 60 feet southeast of angle in county road; iron post marked "DW 3420"..... 3,420.212

Fairburn, about 1 mile southwest of; 550 feet northeast of bridge $\left(\frac{H}{138}\right)$, 50 feet southeast of private-road crossing; spike in northwest side of southwest gatepost..... 3,344.82

Fairburn; railroad water tank, northeast bent of support; copper nail in top of northwest end of sill..... 3,315.28

Fairburn to Hermosa.

Fairburn; 200 feet northeast of station, 40 feet northeast of county-road crossing; iron post marked "DW 3310"..... 3,310.260

Fairburn, 1 mile north of; north bent of bridge $\left(\frac{H}{140}\right)$; copper nail in top of east end of cap, 20 feet above ravine and wagon road..... 3,220.33

Fairburn, 1.7 miles north of; 70 feet southeast of county-road crossing, spike in east side of corner fence post, 1 inch above ground 3,335.92

Fairburn, 2.8 miles north of; 50 feet south of road crossing, 8 feet west of railroad; spike in west side of fence post at end of cattle guard, 1 inch above ground..... 3,284.49

Hermosa, 5.8 miles south of; 270 feet north of section house No. 12, 60 feet southeast of county-road crossing 6 feet northwest of fence corner post; iron post marked "DW 3430"..... 3,430.418

Hermosa, 5.3 miles south of; 3,300 feet northwest of section house No. 12, 100 feet south of east and west fence; spike in west side of telegraph pole, 2 inches above ground 3,453.98

Sec. 13, T. 3 S., R. 7 E; 130 feet west and 20 feet north of east quarter corner; spike in west side of telegraph pole, 4 inches above ground 3,506.35

Hermosa, about 3 miles southwest of; 880 feet north of southeast corner of sec. 12, T. 3 S., R. 7 E., 180 feet north of bridge $\left(\frac{H}{159}\right)$, in center of county-road lane at bend in road; iron post marked "DW 3458"..... 3,458.255

Hermosa station, about 1 mile southwest of; 50 feet northwest of cattle guard, 360 feet southeast of northeast corner of sec. 6, T. 3 S., R. 8 E.; spike in north side of fence corner post, 3 inches above ground 3,314.37

Hermosa; railroad water tank; copper nail in top of west end of sill of second bent from north 3,297.50

Hermosa; 150 feet southwest of station, 60 feet west of track, in southwest corner of station agent's private yard; iron post marked "DW 3300".. 3,300.283

Hermosa to Brennan.

Hermosa, 1 mile north of; 500 feet north of bridge $\left(\frac{H}{168}\right)$, 50 feet west of track; spike in east side of fence corner post 3,317.36

Hermosa, 3.2 miles north of; 30 feet south of county-road crossing, 5 feet east of track, 200 feet south of mile board 82; spike in southwest side of inclined post of cattle guard..... 3,450.42

Hermosa, 4.3 miles north of; 740 feet west of east side of and 35 feet south of north side of sec. 8, T. 2 S., R. 8 E., 115 feet southwest of county-road crossing, 400 feet southeast of dwelling house, 50 feet northwest of track, 4 feet north of fence corner post; iron post marked "DW 3503"..... 3,503.242

	Feet.
Spring Creek, 200 feet south of; 200 feet south of section house No. 14, east end of stone culvert (H 185½); projection on top of south end of coping stone, marked ⊰⊱	3,292.99
Spring Creek; 30 feet above stream, top of rail on bridge (H 186)	3,282.1
Spring Creek; 1,200 feet northeast of bridge (H 186), 60 feet west of county-road crossing; spike in southwest side of telegraph pole, 1 foot above ground	3,292.90
Spring Creek, ½ mile north of; 90 feet southwest of crossing of county road running north and south over railroad, 25 feet west of county road, 40 feet southeast of track, 80 feet southwest of crossing signpost marked (U.S.G.S. B.M. W.P.); iron post marked "DW 3326"	3,326.184
Brennan, 2 miles south of; 250 feet southeast of county-road crossing, 20 feet southwest of county road, southwest corner of Getchell's ranch, 1 foot south of north quarter corner of sec. 14, T. 1 S., R. 8 E.; iron post marked "DW 3160"	3,160.295
Brennan siding; 1,300 feet south of section house No. 215, 75 feet southwest of county-road crossing, 80 feet west of signpost marked "Brennan" and scribed (U.S.G.S. B.M. W.P.); iron post marked "DW 3114"	3,114.280

Brennan to Rapid City.

Brennan, about 2 miles northwest of; 50 feet northeast of track; spike 3 inches above ground in west side of post at intersection of north and south fence with railroad fence	3,188.71
Rapid City, 4.2 miles south of; 250 feet north of Hermosa and Rapid City county road, northeast side of railroad; spike in north side of short post bearing number of culvert (H 197½)	3,269.73
Rapid City, 3 miles southeast of; sec. 23, T. 1 N., R. 8 E., 1,200 feet east of northwest corner and 30 feet south of north line, 50 feet west of track, 40 feet east of angle in county road; iron post marked "DW 3218"	3,218.250
Rapid City, 2.2 miles southeast of; east end stone culvert (H 201) ⊰⊱ on top of coping stone, 2 inches from north end	3,172.30
Rapid City, 1½ miles southeast of; 120 feet northwest of county-road crossing; spike 3 inches above ground in west side of telegraph pole	3,174.26
Rapid City, railroad water tank; sill of second bent of support from west end; copper nail in top, 1½ feet from south end	3,196.22
Rapid City; top of rail, main track, in front of ticket office	3,198.2
Rapid City, courthouse yard; 80 feet southwest of southwest corner of courthouse; bronze tablet in center of top of U.S.G.S. astronomic pier, marked "DW 3228." (Center of plate carefully centered over original cross cut in pier.)	3,228.744
Rapid City, west end of town; 500 feet east of Gate City rolling mill, 30 feet south of track; spike in north side of telegraph pole, 3 inches above ground	3,244.32

Rapid City to Blackhawk.

Rapid Creek; top of rail of bridge (H 210)	3,263
Rapid City station, 3 miles west of; 40 feet southeast of crossing of Rapid City and Rochford wagon road, 400 feet east of section house; No. 17; spike in west side of cottonwood tree, 6 inches above ground	3,266.45

	Feet.
Rapid City station, 4.3 miles northwest of; bridge (H 214); copper nail in top of west end of cap on south bent	3,351.31
Rapid City station, 5⅛ miles northwest of; 65 feet southwest of crossing of Rapid City and Blackhawk county road, 50 feet west of track, 80 feet south of crossing, signpost scribed (U.S.G.S. B.M., W.P.), 4 feet north of fence corner post; iron post, marked "DW 3457"	3,457.386
Box Elder Creek; top of rail on bridge (H 225), 25 feet above stream bed	3,455.2
Blackhawk, 1 mile southeast of; 90 feet northwest of Rapid City and Blackhawk county-road crossing; spike in southwest side of fence corner post, 4 inches above ground	3,495.02
Blackhawk; top of rail in front of ticket office	3,493.5

Blackhawk to Piedmont.

Blackhawk; 100 feet northwest of station, in west corner of yard on northwest side of building; iron post marked "DW 3491"	3,491.295
Blackhawk, 3,600 feet northwest of; 80 feet west of county-road crossing; spike in southwest side of fence corner post, flush with ground	3,521.92
Blackhawk, 1.4 miles northwest of; 55 feet west of county-road crossing, on opposite side of track from mile board (H 108); spike in west side of fence corner post, 3 inches above ground	3,563.14
Blackhawk, 2.4 miles northwest of; top of divide between Blackhawk and Piedmont, 90 feet east of county-road crossing, 50 feet northeast of track, 25 feet south of county road running along east and west section line, 1,150 feet east of northwest corner of sec. 31, T. 3 N., R. 7 E.; iron post marked "DW 3622"	3,622.341
Piedmont, 2 miles southeast of; 300 feet southeast of mile board (H 111), 55 feet north of road crossing; spike in west side of fence corner post, 3 inches above ground	3,546.77
Piedmont; 1,400 feet southeast of station, stone culvert (H 238), southwest end, northwest side of stream, in top of wing wall, 1 foot below top of coping stone, 140 feet northeast of telegraph pole marked (U.S.G.S. B.M., WP.); bronze tablet marked "DW 3460"	3,460.405

Piedmont to Tilford.

Piedmont, 0.8 mile northwest of; 45 feet northeast of east and west county-road crossing; spike in northeast side of round fence corner post, 2 inches above ground	3,503.91
Elk Creek; top of rail of bridge (H 244), 8 feet above stream bed	3,544
Tilford, 2 miles southeast of; about 75 feet northwest of point at which Elk Creek wagon road crosses railroad track, ¼ mile east of the mouth of Elk Creek Canyon, 150 feet northwest of junction of Elk Creek wagon road with the Sturgis and Rapid City road; iron post, marked "DW 3565".	3,565.056
Tilford, ½ mile southeast of; top of rail in center of bridge (H 248)	3,568.5
Tilford; spike in top of west end of south cap under railroad water tank.	3,580.07
Tilford, top of rail in front of station at	3,579.8

Tilford to Sturgis.

	Feet.
Tilford, ¼ mile northwest of; spike in top of stringer on west side over cap of third bent from north end of bridge $\left(\frac{H}{250}\right)$	3,594.21
Tilford, 2¼ miles northwest of; 45 feet northeast of railroad crossing, on east side of Sturgis and Rapid City wagon road; iron post, marked "DW 3693"	3,693.511
Sturgis, 6½ miles southeast of; top of iron driftbolt on west end of south cap of bridge $\left(\frac{H}{254}\right)$, about 400 feet northwest of north switch at Beaver siding	3,641.24
Beaver siding, ¼ mile northwest of; top of rail at Pleasant Valley road crossing	3,645.8
Sturgis, 5½ miles southeast of; about 500 feet southeast of Beaver siding mile board, top of iron driftbolt on west end of south cap of bridge $\left(\frac{H}{256}\right)$	3,663.74
Sturgis, 4¼ miles southeast of; 960 feet southeast of switch at Myers's siding, 50 feet north of track, and 100 feet south of Sturgis and Rapid City wagon road; iron post marked "DW 3622"	3,622.103
Bridge $\left(\frac{H}{260}\right)$, top of rail in center of, just southeast of switch at Myers's siding	3,620.4
Switch at Myers's siding, top of rail at	3,616.9
Bridge $\left(\frac{H}{263}\right)$, about 1 mile north of Myers's siding; top of rail in center of.	3,641.5
Sturgis, 2¾ miles southeast of; iron driftbolt on top of the west end of north cap of bridge $\left(\frac{H}{264}\right)$; Sturgis and Rapid City wagon road passes under bridge	3,633.03
Sturgis, 1¾ miles southeast of; spike in top of north stringer, just over cap of fourth bent from east end of bridge $\left(\frac{H}{266}\right)$	3,561.74
Sturgis, ¾ mile southeast of; top of iron driftbolt on north end of west cap of culvert $\left(\frac{H}{268}\right)$ over Dead Mans Creek	3,492.79
Sturgis; spike in top of south end of east cap of bridge $\left(\frac{H}{271}\right)$, a little to the south of the court-house	3,452.12

Sturgis to Whitewood.

Sturgis; about ¼ mile northwest of Fremont, Elkhorn and Missouri Valley Railroad station and 105 feet northeast of the first road crossing; iron post, marked "DW 3484"	3,484.468
Sturgis, 1 mile northwest of; top of iron driftbolt on top of north end of west cap of bridge $\left(\frac{H}{274}\right)$ across Bear Butte Creek	3,516.06
Sturgis, 2¼ miles northwest of; 45 feet northeast of road crossing, 36 feet east of signpost, and about 500 feet southwest of N. ¼ cor. sec. 1, T. 5 N., R. 4 E., marked "DW 3615"	3,614.923
Whitewood, 2¾ miles southeast of; top of iron driftbolt on south end of west cap of large culvert $\left(\frac{H}{282}\right)$	3,574.66
Whitewood, 2 miles southeast of; spike on top of south end of east cap of bridge $\left(\frac{H}{285}\right)$ over a branch of Spring Creek	3,587.90
Whitewood, 1¼ miles southeast of; top of rail at crossing, 50 feet west of mile board	3,618.7

	Feet.
Whitewood, 1 mile southeast of; 50 feet south of Sturgis and Whitewood wagon road, 70 feet southwest of road crossing, ¼ mile east of northwest corner of sec. 27, T. 6 N., R. 4 E.; iron post marked "DW 3590"	3,590.088
T. 6 N., R. 4 E., northwest corner sec. 27	3,590

DEADWOOD TO STURGIS, VIA PUBLIC ROAD.

Deadwood; top of west rail on main line, opposite south end of Fremont, Elkhorn and Missouri Valley Railroad freight depot	4,501.5
Deadwood, 1 mile east of; center of wagon road at mouth of Spruce Gulch, under Burlington and Missouri River Railroad trestle	4,469.4
Deadwood, 1 mile east of; top of west end of pile under south end of the west sill of water tank at roundhouse of Fremont, Elkhorn and Missouri Valley Railroad	4,460.8
Smelter, road crossing at signpost west of; top of north rail	4,412
Smelter, road crossing at signpost north of; top of east rail	4,404
Whitewood Creek, in wagon road on east side of, and at the mouth of Split Tail Gulch	4,395
Deadwood, 2 miles east of; on northwest corner of large rock in mouth of Split Tail Gulch	4,402.99
Split Tail Gulch, at fork of; on north side of culvert	4,417
Deadwood, 2¼ miles east of; spike in root on northeast side of 20-inch dead pine tree, west of powder house and east of overhanging rock, and just north of road crossing	4,488.97
Deadwood, 2½ miles east of; spike on north side of telegraph pole on south side of road, east of a log cabin and stable	4,573.80
Intersection of Galena road with the Sturgis road	4,620
Deadwood, 3 miles east of; spike on north side of telephone pole on top of divide, on south side of road, and just south of log cabin standing on north side of road and fronting south	4,709.61
Center of road at forks of Sturgis and Whitewood roads, near head of Peedee Gulch, just east of Deadwood fair grounds	4,660
Deadwood, 3¾ miles east of; spike in south side of telegraph pole about 80 feet northwest of culvert across Peedee Gulch, 400 feet northeast of a frame shanty and two frame stables	4,552.17
Deadwood, 4¼ miles east of; south side of road about 1 mile east of the Deadwood fair grounds, and about 75 feet east of wagon bridge over Peedee Creek; iron post on a flat bench, marked "DW 4454"	4,453.725
Deadwood, 5 miles east of; spike on north side of 18-inch pine on south side of road, opposite a limestone ledge between two projecting ledges, southwest of projecting ledge with large anvil-shaped rock on top	4,284.71
Deadwood, 5½ miles east of; spike in west side of telegraph pole on east side of road, about 125 feet northwest of mouth of Two Bit (junction of Two Bit and Boulder Gulch), and about 400 feet northeast of Crook's cabin	4,218.16
Deadwood, 6¼ miles east of; spike on east side of telegraph pole on west side of road, on top of divide	4,241.37
Sturgis, 5¾ miles west of; spike in root on north side of 15-inch burr oak, at point where road makes a sharp turn to the east toward Boulder Park, after leaving the main divide on the north side	4,144.99
Forks of Sturgis and Whitewood roads, just east of Boulder Park	4,048
Sturgis, 4¾ miles west of; spike on north side of telephone pole, about 125 feet south of road, first pole east of the northwest corner of fence of large field, on south side of road running from Bear Butte Canyon westerly to timber	3,957.58

	Feet.
Sturgis, 3¼ miles west of; top of large limestone bowlder on south side of road, 460 feet east of the "Barroom" and 50 feet southwest of Bridge across Bear Butte Creek; copper bolt marked "DW 3814"	3,814.110
Sturgis, 2¾ miles west of; spike on west side of telephone pole, on east side of Sturgis road, north of a high peak, where Bear Butte Creek runs north and south in Bear Butte Canyon	3,689.56
Sturgis, 2½ miles west of; spike on west side of telephone pole, on east side of road just east of a deserted frame shanty and small slab stable in Bear Butte Gulch, about 1 mile from its mouth	3,647.42
Sturgis, 1¼ miles west of; on south side of road and about 400 feet northeast of an old deserted log cabin on west side of mouth of canyon, at extreme north end of east ledge of Bear Butte Canyon; top of north end of stone	3,575.94
Sturgis; at first road crossing west of station; spike in root on southwest side of scrub oak, northeast of signboard, north of Fremont, Elkhorn and Missouri Valley Railroad	3,483.35

DEADWOOD TO WHITEWOOD, VIA CENTENNIAL PARK.

Deadwood, 1½ miles north of; spike in north side of telephone pole on south side of Deadwood and Spearfish road, northwest of the Chlorination Works, and about 500 feet southwest of the limekiln	4,542.18
Deadwood, 1¾ miles north of; spike in west side of telephone pole on east side of road, just north of Smelter, and northwest of mouth of Split Tail Gulch	4,675.64
Deadwood, 2½ miles north of; spike on south side of telephone pole on south side of road, on top of main divide	4,858.71
Deadwood, 2¾ miles north of; spike in north side of telephone pole on south side of road, in bottom of Kellers Gulch	4,731.17
Deadwood, 3½ miles north of; spike in west side of telephone pole on top of the second divide north of Deadwood, on east side of road, and east from a point where an old road branches to the northwest	4,791.25
Deadwood, 3¾ miles north of; spike on top of charred fence post on west side of road, about ¼ mile south of the "Halfway house" at forks of road	4,632.14
Deadwood, 1½ miles north of; spike in top of stump on east side of road, about 1,000 feet south of "Halfway house"	4,424.14
Deadwood, 1½ miles north of; about 63 feet east of the southeast corner of a large two-story frame dwelling known as the "Halfway house," just east of forks of road; iron post marked "DW 4360"	4,359.925
Top of charcoal furnace on west side of Deadwood and Spearfish road	4,194
Deadwood, ¾ miles north of; spike in east side of telephone pole on west side of road, about ¼ mile north of the charcoal furnace	4,098.60
Deadwood, 6½ miles north of; 500 feet southeast of round stone water tank at Centennial Park, southeast of the intersection of the Deadwood and Spearfish road and the old Spearfish and Whitewood road; iron post marked "DW 4005"	4,004.623
Centennial Park, about ¼ mile east of; center of road; southwest corner sec. 25, T. 6 N., R. 3 E	3,971
Centennial Park, 1.4 miles east of; spike in west side of a large fence post just east of a blacksmith shop, at the southeast corner of sec. 25, T. 6 N., R. 3 E	3,897.81
Whitewood, 3¾ miles southwest of; spike on north side of telephone pole, 1,200 feet northeast of forks of Deadwood and Whitewood and Whitewood and Spearfish roads, about 60 feet south of stone schoolhouse	3,999.71

	Feet.
Whitewood, 2¼ miles southwest of; top of rail at signboard, where Whitewood and Deadwood road crosses the Fremont, Elkhorn and Missouri Valley Railroad	3,960.9
Whitewood, 2¼ miles southwest of; spike on east side of telephone pole on west side of road, southwest of Fremont, Elkhorn and Missouri Valley Railroad crossing	3,967.72
Whitewood, 1¼ miles south of; about ¼ mile west of Crook City, spike on top of gate post about 40 feet west of road crossing southeast of an old deserted frame house	3,837.16
Whitewood, 1 mile south of; 16 feet northeast of mile board, 18 feet east of Fremont, Elkhorn and Missouri Valley Railroad track; iron post marked "DW 3751"	3,751.431
Whitewood; spike on top of south end of third sill from west end of the south platform of Fremont, Elkhorn and Missouri Valley Railroad station	3,643.97

STURGIS NORTHERLY ABOUT 5 MILES, VIA SPRING CREEK PUBLIC ROAD.

Sturgis, 1¼ miles northwest of; spike in top of northwest corner charred fence post, Spring Creek road leaves section line and turns northeast, about ¼ mile north of railroad bridge across Bear Butte Creek	3,618.69
Railroad bridge across Bear Butte Creek, top of divide about 1 mile north of; center of Spring Creek road	3,728
Top of bridge across Spring Creek	3,323.5
Sturgis, 4 miles northwest of; spike in top of corner fence post southwest of crossroads, just north of bridge over Spring Creek	3,342.25
Sturgis, 5 miles northwest of; 400 feet southwest of large red barn with two ventilators on top, about 2,050 feet north of southwest corner of sec. 17, T. 6 N., R. 5 E.; iron post on east side of Spring Creek road, marked "DW 3308"	3,308.041

TILFORD TO ENGLEWOOD, VIA BLACK HILLS AND FORT PIERRE RAILROAD.

Miller's platform, Black Hills and Fort Pierre Railroad, near mouth of Elk Creek Canyon; top of north rail	3,610
Jones's siding, 2¾ miles east of; spike in southeast side of telephone pole northeast of a bridge about ¼ mile west of mouth of Elk Creek Canyon.	3,635.46
Jones's siding, 2.1 miles east of; nail in telegraph pole north of road crossing and northeast of wagon-road bridge and railroad bridge	3,699.85
Jones's siding, 1 mile east of; spike in telephone pole 50 feet east of road crossing just southeast of railroad bridge and wagon bridge across Elk Creek	3,803.60
Quarry siding, top of rail in front of platform at	3,860.8
Jones's siding, top of rail at road crossing just east of switch at	3,888.3
Jones's siding, spike in top of west end of east sill under water tank at	3,904.30
Jones's siding, ¼ mile west of; nail on top of the east end of north cap of railroad bridge	3,936.19
Jones's siding, ½ mile west of; spike in telegraph pole on north side of track just west of railroad bridge	3,988.61
Jones's siding, 1¼ miles west of; spike in top of north end of east cap of railroad bridge, ¼ mile southwest of Knife-Blade Point	4,113.08
Runkels, 2¼ miles east of; spike in top of west end of north cap of railroad bridge just southwest of stairway leading to Crystal Cave	4,241.13
Crystal Cave platform, top of rail at	4,249.6
Runkels, 1¼ miles east of; spike in top of south end of west cap of railroad bridge northwest of section house, ¼ mile west of 28-mile post	4,352.80

	Feet.
Runkels, 450 feet east of station; 15 feet north of track, just southwest of sawmill, on top of 10 by 15 by 8 foot limestone bowlder; copper bolt marked "DW 4498"	4,498.313
Runkels, 1½ miles west of; spike on top of south end of east cap of railroad bridge, about 500 feet north of switch at Haven's siding	4,586.84
Mowatts's siding, 75 feet east of the east switch, just north of an old log cabin, in limestone bowlder 10 feet north of track; copper bolt marked "DW 4720"	4,720.440
Elk Creek station, ½ mile east of; spike in top of north end of east cap of railroad bridge, south of Elk Creek wagon-road bridge	4,825.79
Elk Creek station, top of rail in front of platform at	4,840.6
Elk Creek station, ½ mile west of; 30 feet south of railroad and 60 feet south of point where Galena and Greenwood road crosses track; iron post marked "DW 4882"	4,881.974
Anthony's station, spike on top of east end of east cap of railroad bridge, about 300 feet north of the north switch	4,961.74
Anthony's station, top of frog at west end of	4,977.6
Perry, 2 miles east of; spike in top of south end of west cap of railroad bridge, just east of Buck's landing and near mouth of small creek coming into Elk Creek from the southeast	5,217.60
Perry, 1½ miles east of; 30 feet northeast of switch at junction of the Box Elder branch of Black Hills and Fort Pierre Railroad; copper bolt on top of point of ledge marked "DW 5269"	5,269.303
Portuguese siding, top of rail at signpost	5,341.25
Perry, top of rail at road crossing at southeast corner of platform	5,400.2
Perry, spike in telegraph pole on south side of track and east side of wagon road, just southeast of platform	5,397.97
Mile board 15, top of rail at	5,476.6
Brownsville station, 650 feet southeast of; 20 feet west of track, 60 feet northwest of road crossing, 80 feet southwest of second switch block from station; iron post marked "DW 5496"	5,495.943
Brownsville station, top of rail at	5,502.2
Mile board 14, top of rail at	5,452.1
Road crossing, top of rail at; west of switch at Galena Junction	5,427.8
Road crossing, spike in telegraph pole on south side of track opposite to	5,430.28
Mile board 12, spike in top of	5,638.58
Woodville station, 1½ miles east of; 3½ miles northwest of Brownsville, 20 feet east of Elk Creek and Kirk wagon road, 25 feet north of railroad; iron post marked "DW 5743"	5,742.904
Woodville station, top of rail at switch block in front of	5,933.7
Woodville station, 80 feet southeast of switch at; 35 feet south of main track; in top of a large quartzite bowlder, copper bolt marked "DW 5938"	5,938.233
Woodville, ¼ mile northwest of; spike in telegraph pole 20 feet north of track	5,798.99
Englewood, ½ mile north of; top of north rail of Black Hills and Fort Pierre Railroad on trestle over center of Burlington and Missouri River Railroad track	5,545.3
Englewood, ½ mile north of; top of rail opposite Black Hills and Fort Pierre Railroad transfer station	5,546.1

ENGLEWOOD TO SPEARFISH, VIA SPEARFISH BRANCH OF BURLINGTON AND MISSOURI RIVER RAILROAD.

Englewood, 1 mile northwest of; spike in north side of mile board	5,700.52
Englewood, 2 miles northwest of; 40 feet north of track, and 40 feet west of the Dumont and Lead City wagon road, about 75 feet northwest of bridge over railroad; iron post marked "DW 5862"	5,861.885

	Feet.
Terry, top of north rail of main line in front of station	6,163.9
Terry, 225 feet north of station, 30 feet east of north end of a short switch on ledge about 2 feet above the surface of ground; bronze tablet marked "DW 6165"	6,165.086
Portland, top of rail at station	6,429.6
Portland, 40 feet south of and 600 feet northwest of station at forks of wagon road 60 feet northeast of railroad (the only crossing between North and South Portland); iron post marked "DW 6426"	6,425.897
Crownhill, top of rail in front of station	6,153.4
Crownhill, 60 feet south of station, 40 feet west of track; iron post marked "DW 6153"	6,152.874
Crownhill, 2.4 miles southeast of; spike on top of south end of west cap of bridge No. 6	5,690.63
Elmore, ¼ mile southeast of; spike in top of east end of north cap of bridge No. 9, across Spearfish River	5,216.79
Elmore, top of rail in front of water tank at	5,216.1
Elmore, 120 feet west of water tank, 80 feet south of section house, 40 feet south of track; iron post marked "DW 5218"	5,218.416
Bridge No. 11, across Spearfish River, top of rail in center of bridge	5,182.6
Spearfish, 14 miles south of; 500 feet northwest of switch block at Savoy, in center of top of 12 by 12 by 20 foot limestone bowlder, between Spearfish River and railroad, 40 feet northeast of railroad; bronze tablet marked "DW 4954"	4,953.978
Bridge No. 19, across Iron Creek, top of rail in center of bridge	4,819.3
Maurice, top of rail opposite section house	4,463.7
Spearfish, 8¾ miles south of; 40 feet west of railroad, 240 feet northeast of section house, 330 feet southwest of water tank, in top of limestone bowlder between section house and water tank; copper bolt marked "DW 4470"	4,469.744
Spearfish, 7½ miles south of; spike in top of east end of north cap of bridge No. 21	4,361.13
Spearfish, 6 miles south of; spike in north end of west cap of bridge No. 26.	4,162.94
Spearfish, 5 miles south of; spike in top of east end of south cap of bridge No. 27	4,033.62
Spearfish River, bed of; opposite electric light plant	3,877
Spearfish, 3½ miles south of; 460 feet south of Spearfish electric light plant and 50 feet east of track, between track and Spearfish River; iron post marked "DW 3892"	3,891.964
Spearfish, 1½ miles south of; top of large iron driftbolt on west end of north cap on south pier of iron bridge across Spearfish River	3,727.73
Spearfish, top of rail in front of station	3,636.7
Spearfish, southwest corner of the Star & Bullock stone building on corner of Sixth and I streets; bronze tablet in water table marked "DW 3647".	3,647.255
SPEARFISH TO CENTENNIAL PARK, VIA PUBLIC ROADS.	
Spearfish, 2 miles east of; spike in telephone pole opposite a road which runs south from the Spearfish and Deadwood wagon road	3,857.06
Center of Spearfish and Deadwood wagon road, on east line of T. 6 N., R. 2 E	3,909
Spearfish, 3½ miles southeast of; spike in telephone pole on north side of Spearfish and Deadwood road, opposite the Avery Dairy	3,937.49
Spearfish, 4½ miles southeast of; 50 feet south of crossroads and 260 southwest of water tank, about 50 feet southeast of southeast corner of sec. 18, T. 6 N., R. 3 E.; iron post marked "DW 3942"	3,941.996
T. 6 N., R. 3 E., southeast corner sec. 17; center of crossroads at	3,905

	Feet.
Spearfish, 5¼ miles southeast of; spike in telephone pole on south side of road, about 30 feet southeast of south quarter corner sec. 16, T. 6 N., R. 3 E	3,863.98
Spearfish, 6 miles southeast of; 40 feet southeast of southeast corner stone of sec. 16, T. 6 N., R. 3 E., 20 feet south of wagon road; iron post marked "DW 3815"	3,814.988
Centennial Park, 2½ miles north of; spike in telephone pole on east side of road, about 50 feet southeast of southeast corner of sec. 15, T. 6 N., R. 3 E.	3,775.81

CIRCUIT COMMENCING AT BRONZE TABLET BENCH MARK 3½ MILES NORTHWEST OF CUSTER ON BURLINGTON AND MISSOURI RIVER RAILROAD, ALONG PUBLIC ROAD TO BUCK SPRING AND SOUTH TO HELL CANYON AND PASS CREEK, THENCE EAST TO BURLINGTON AND MISSOURI RIVER RAILROAD AT TEMPORARY BENCH MARK ABOUT HALF A MILE SOUTH OF LORING SIDING.

Berne Siding to Bear Spring public road.

Pleasant View ranch, ¼ mile southeast of; ¼ mile northeast of Wright's ranch, 800 feet south of small bridge on Custer and Deadwood road, 30 feet southeast of road from Wright's ranch to Custer, 50 feet west of large pine tree blazed on west side; large rock at north end of ledge 50 feet long, point marked ⋊ near center of top rock, and about 15 feet above road	5,701.48
Wright's ranch, ¼ mile west of; 100 feet southeast of junction of two roads, 200 feet east of timber; spike in top of root on east side of detached 2-foot pine tree	5,765.97
Wright's ranch, 1¼ miles west of; 1,300 feet east of small butte covered with white quartz rock, 3,000 feet east of fork in road, rocky ridge running across road northwest and southeast 30 feet south of county road, large outcrop 30 by 30 feet 6 feet high, 7 feet west of northeast corner and 4 feet above ground; three pine trees marked $\left(\begin{smallmatrix}\text{U.S.G.S}\\ \text{B.M. W.T.}\end{smallmatrix}\right)$ as follows: Southeast, 18 feet; northeast, 35 feet; northwest, 35 feet; bronze tablet marked "DW 5871"	5,871.199
Wright's ranch, 2 miles west of; 45 feet west of fork in road, 1,700 feet west of small quartz-covered butte on north side of road; spike in root on north side of 2-foot pine tree	5,998.3
Wright's ranch, 3 miles west of; 3,000 feet west of placer mine, 400 feet northwest of fork in road, 150 feet north of road to placer mine, 40 feet northeast of Custer and Bear Springs road, spike in root on north side of 1½-foot pine tree	6,008.28
Henderson's ranch, 2,000 feet east of; 75 feet northwest of fork in county roads, 30 feet north of Custer and Bear Springs road; three pine trees marked (U.S.G.S. B.M. W.T.) as follows: 15 inches in diameter, southeast 133 feet; 30 inches in diameter, north 23 feet; 24 inches in diameter, northwest 49 feet; iron post marked "DW 6060"	6,060.150
Peterson's ranch, 1,400 feet northwest of; 50 feet west of right angle bend in Custer and Bear Springs road; spike in root on northeast side of 2-foot pine tree	6,131.69
Peterson's ranch, 1 mile west of; at foot of steep hill going on top of limestone, 8 feet south of county road; spike in root on north side of 1-foot pine tree	6,281.40
Peterson's ranch, 1½ miles west of; in gap on top of divide between heads of French Creek and Hell Canyon, 10 feet north of Custer and Bear Springs wagon road, 5½ feet northwest of southeast corner of sec. 33, T. 2 S., R. 3 E.; two pine trees marked "U.S.G.S. B.M. W.T.," as follows: 1 foot in diameter, west 11 feet; 15 inches in diameter, east 30 feet; iron post marked "DW 6443"	6,443.140

Feet.

Bear Springs, 2¼ miles southeast of; 2 miles north of Bull Springs, 2,000 feet north of fork in road, 20 feet west of road from Bull Spring to Bear Spring, 200 feet northwest of junction of two ravines; spike in root on east side of charred pine snag 6,404.21

Bear Spring, 1¾ miles southeast of; 300 feet east of top of divide between Bear Spring and Bull Spring gulches, 5 feet north of Custer and Bear Spring road; spike in root on southeast side of 1-foot pine tree 6,628.55

Bear Spring, 1½ miles southeast of; 30 feet northeast of Custer and Bear Spring road, ½ mile northwest of crossing over top of divide between Bear Spring and Bull Spring gulches; copper nail in root on west side of 15-inch pine tree on east side of small park 6,514.04

Bear Spring to Buck Spring public road.

Alkali Spring, 1 mile northwest of; 520 feet northwest of fork in roads, one going to Buck Spring, the other down west side of Hell Canyon; 65 feet northeast of Buck Spring road, near top of limestone rock 24 by 4 by 2½ feet high; two pine trees marked "U.S.G.S. B.M. W.T.," as follows: 10 inches in diameter, north 150 feet; 18 inches in diameter, southeast 180 feet; bronze tablet marked "DW 6224" 6,224.238

Alkali Springs, 2½ miles northwest of; 200 feet southeast of top of divide, 35 feet northeast of Custer and Buck Springs road; spike in root on southwest side of 18-inch pine stump 5 feet high 6,417.52

Alkali Spring, 3½ miles northwest of; ¼ mile northwest of top of divide near southeast corner of park, 30 feet north of Custer and Buck Springs road; spike in root on northwest side of 30-inch pine tree 6,230.19

Alkali Spring, 3½ miles northwest of; 4,000 feet east of road crossing over west fork of Hell Canyon, 25 feet south of Custer and Buck Springs road, in scattered timber on top of ridge; three pine trees marked "U.S.G.S. B.M. W.T.," as follows: 10 inches in diameter, southeast 30 feet; 10 inches in diameter, west 65 feet; ten inches in diameter, north 45 feet; iron post marked "DW 6325" 6,325.510

West fork of Hell Canyon, 45 feet east of dry stream bed, 70 feet southwest of Custer and Buck Spring road; spike in root on south side of 2½-inch pine tree 6,144.81

West fork of Hell Canyon, 2,000 feet west of; 20 feet southwest of Custer and Buck Spring road; wire nail in root on north side of 15-inch tall dead pine tree 6,251.35

West fork of Hell Canyon, 1 mile northwest of; 50 feet southwest of Custer and Buck Spring road, 150 feet northeast of edge of timber; spike in root on north side of dry pine snag 10 feet high 6,302.70

Buck Spring, 5¼ miles northeast of; 2.3 miles northeast of point where Custer and Buck Spring road descends into bottom of Gillett's Canyon, 25 feet west of road; two pine trees marked "U.S.G.S. B.M. W.T., as follows: northwest, 40 feet; southeast, 75 feet; iron post marked "DW 6193" 6,193.251

Buck Spring, 4¼ miles northeast of; 1.6 miles northeast of point where Custer and Buck Spring road enters Gillett's Canyon, 8 feet southeast of road; spike in root on west side of 15-inch pine tree 6,084.52

Buck Spring, 4 miles northeast of; 30 feet north of Custer and Buck Spring road, 1.1 miles northeast of point where road enters bottom of Gillett's Canyon; spike in root on south side of 18-inch pine tree on north side of clump of large trees 5,981.53

Gillett's Canyon, on top of slope, east side, 20 feet northwest of Custer and Buck Spring road at top of steep descent into bottom of canyon; spike in root in southeast side of 18-inch pine tree 5,827.54

	Feet.
Buck Spring, 3 miles east of; 30 feet southwest of and about 10 feet above Custer and Buck Spring road, 250 feet east of point where road crosses dry stream bed in Gillett's Canyon after descending steep hill; in top of limestone outcrop 2 by 2 by 2 feet high; three pine trees marked "U.S.G.S. B.M. W.T.," as follows: 15 inches in diameter, east 250 feet; 10 inches in diameter, northwest 12 feet; 12 inches in diameter, south 45 feet; bronze tablet marked "DW 5627"	5,627.338
Buck Spring, 2 miles east of; 30 feet north of Custer and Buck Spring road, 400 feet northwest of mouth of deep narrow gulch up which road runs, on bank 25 feet above road; spike in root on north side of 15-inch pine tree	5,697.73
Buck Spring, 1¼ miles east of; 6 feet northwest of Custer and Buck Spring road, 200 feet east of top of divide between Gillett's and Buck Spring canyons; spike in root on southwest side of 18-inch pine tree	5,798.63
Buck Spring, about 1 mile east of; 20 feet north of road from Custer; spike in root on north side of 14-inch dead pine tree, 25 feet high	5,653.55
Buck Spring, 100 feet southeast of; 330 feet southwest of Kemp's dwelling house, 45 feet west of road down Buck Spring Canyon; in top of north end of limestone rock, 4 by 6 feet, 18 inches above ground; two pine trees marked "U.S.G.S. B.M. W.T.," as follows: 14 inches in diameter, northwest 200 feet; 15 inches in diameter, southeast 20 feet; bronze tablet marked "DW 5432"	5,432.297

Buck Spring to Pass Creek public road.

Buck Spring, 0.7 mile south of; 45 feet northwest of road down canyon; spike in root on east side of 3-foot pine tree	5,339.26
Buck Spring, about 2 miles south of; 8 feet northwest of road down canyon, 6 feet southeast of dry rocky stream bed; spike in southeast side of 20-inch pine tree 6 inches above ground	5,173.66
Buck Spring, 3.2 miles south of; 150 feet east of dry stream bed in Buck Spring Canyon, 60 feet southeast of and about 10 feet above wagon road, near foot of a point topped with high vertical faced rock, where road again enters canyon after crossing a ridge to the northeast; in top of gray sandstone outcrop 3 feet wide and 2½ feet high, three pine trees marked "U.S.G.S. B.M. W.T.," as follows: 20 inches in diameter, southeast 6 feet; 5 inches in diameter, southwest 50 feet; 12 inches in diameter, north 27 feet; bronze tablet marked "DW 5050"	5,050.270
Buck Spring, 4½ miles south of; 100 feet southeast of dry-stream bed of Buck Spring Canyon, 500 feet south of old stone chimney near water hole, 50 feet southeast of and 20 feet above road; spike in west side of 22-inch pine tree	4,895.64
3-C-S, or Campbell ranch, 700 feet southwest of; 80 feet east of fork in roads, 1,000 feet east of junction of Gilletts and Buck Spring canyons, on top of small rocky point; iron post marked "DW 4727"	4,727.367
Coe's ranch, 3,400 feet southeast of; 40 feet west of road to Custer, near foot of steep hill going out of Gilletts Canyon; spike in northeast side of 8-inch pine tree	4,777.03
Babcock ranch, ¼ mile northwest of; 1.2 miles southeast of Coe ranch, 30 feet south of Custer and Newcastle road, 200 feet east of junction of road from Babcock ranch, 400 feet east of timbered ravine down which Custer and Newcastle road runs; iron post marked "DW 4950"	4,950.236
Barthold ranch, ¼ mile east of; 500 feet northeast of Coon Creek, 60 feet north of intersection of two wagon roads; iron post marked "DW 4670"	4,670.341

	Feet.
Barthold ranch, 2¼ miles southeast of; 3,300 feet southeast of road crossing over rocky stream bed, 15 feet southwest of road to Pass Creek, in bottom of a ravine; spike in northeast side of 10-inch pine tree	4,542.56
Drew ranch (deserted), 1 mile northwest of; 25 feet southwest of wagon road from Barthold ranch, about midway down steep hill; spike in west side of 6-inch pine tree	4,430.07
Drew ranch, 2,200 feet northwest of; 15 feet southwest of road from Barthold ranch, 35 feet southeast of northwest corner of sec. 2, T. 5 S., R. 1 E., on southeast bank of gulch; iron post marked "DW 4373"	4,373.321
Drew ranch, north corner of garden fence; 4 feet south of wagon road, 100 feet northwest of Tepee Canyon; spike 3 inches above ground in north side of post	4,390.74
Drew ranch, 1.8 miles south of; 30 feet west of road to "S. & G." ranch, 800 feet southwest of two buttes capped with limestone bowlders, about 1 mile northeast of point where road crosses stream in Tepee Canyon, top of long hill; iron post marked "DW 4422"	4,422.276
Drew ranch, 2¾ miles south of; 75 feet east of road to "S. & G." ranch, 180 feet northwest of stream in Tepee Canyon, 300 feet northeast of remains of old log cabin, small group of sandstone rock, 20 feet above bed of stream; ⋈ chiseled on top of rock 1 by 1 by 1 foot in center of group, 2 feet southeast of mound	4,200.37
Hell Canyon and Pass Creek, 3.2 miles north of junction; 15 feet west of road from Drew ranch to "S. & G." ranch, 1,100 feet south of junction with road down west side of Tepee Canyon, on top of ridge covered with scattered quartzite bowlders, 6 feet east of bowlder 12 by 8 by 5 feet; bronze tablet in top of rock 4 by 2 by 1 foot, marked "DW 4294"	4,294.086
Hell Canyon, 3,000 feet north of junction with Pass Creek, 205 feet west of road from Drew's ranch to "S. & G." ranch; copper nail in root of east side of 8-inch pine tree at foot of timbered slope	3,879.52
Hell Canyon and Pass Creek, 1,200 feet west of junction, 75 feet southwest of junction of road down Pass Creek with road from Drew's ranch to "S. & G." ranch; 24 feet southeast of road, 90 feet south of south bank of creek bed; iron post marked "DW 3846"	3,846.434
Sullivan's ranch (deserted), 220 feet west of main dwelling house, 30 feet northeast of road crossing over Pass Creek; spike in root on southeast side of 14-inch cottonwood tree	3,861.88
Sullivan's ranch, 1 mile east of; on south bank of Pass Creek, 250 feet east of mouth of small running stream, 40 feet southeast of road; spike in root on north side of 15-inch cottonwood tree	3,898.40
Sullivan's ranch, 2.6 miles east of; 240 feet south of stream bed in Pass Creek valley, 45 feet south of county road crossing over stream bed, 800 feet west of point at which road runs up out of valley on to a flat prairie; on top of small point of land 10 feet above road; iron post marked "DW 3988"	3,988.322
Sullivan's ranch, 5.8 miles east of; sec. 35, T. 5 S., R. 2 E., 3,800 feet northeast of southwest corner, 25 feet north of county road from "S. & G." ranch, to Custer, 65 feet west of junction with dim road coming in from the northwest, about half way up a long hill; iron post marked "DW 4253"	4,253.397

Pass Creek to Loring siding public road.

Richardson's ranch, 1¼ miles southwest of; 800 feet east of southeast fork of Pass Creek, 5 feet south of county road from "S. & G." ranch, to Custer; spike in root on northwest side of 2-foot pine tree	4,426.56

	Feet.
Richardson's ranch, 1 mile southwest of; 15 feet northwest of road from "S. & G." ranch to Prindle, at junction of road coming in from the southwest; in saddle on top of ridge; iron post marked "DW 4594"	4,594.408
Richardson's ranch, 500 feet southwest of dwelling, 65 feet southwest of county road; spike in root on north side of 20-inch pine tree	4,582.07
Richardson's ranch, 1 mile east of; 140 feet northeast of point at which county road crosses draw; spike in root on north side of 6-inch pine tree	4,677.99
Richardson's ranch, 2 miles east of; 20 feet east of road, 800 feet north of junction of roads, 900 feet south of junction with private road from Richardson's ranch; on top of ridge about 1¼ miles west of Pleasant Valley; iron post marked "DW 4796"	4,796.490
"18-mile" ranch, 1.4 miles east of; 500 feet north of abandoned schoolhouse, northwest corner of Tutt's pasture, southeast of junction of county roads; spike (without head) in northwest side of fence post, 6 inches above ground	4,636.58
Pleasant Valley, bed of stream at crossing	4,624
"18-mile" ranch, ¾ mile west of; 1,200 feet north of Tutt's ranch, 15 feet southwest of county road, 100 feet west of junction of road from "18-mile" ranch with road running up Pleasant Valley, west side of Pleasant Valley, 3 feet northeast of wire fence; iron post marked "DW 4649"	4,649.483
"18-mile" ranch, 1,800 feet northeast of; 180 feet southwest of fork in stream bed, 90 feet northwest of water hole; brown sandstone 5 by 3 feet by 1 foot high, circle and radial lines ⊱⊰ on northwest end	4,690.97
"18-mile" ranch, about 2 miles southeast of; 6 feet west of road from "18-mile" to Horgan's ranch, 1,500 feet north of top of divide; spike in root on east side of 2½-foot pine tree	4,850.13
Horgan's ranch, 2 miles northwest of; 15 feet west of road from Loring siding to "18-mile" ranch, 350 feet fouth of top of divide over which road crosses; iron post, marked "DW 4916"	4,916.646
Horgan's ranch, ¾ mile southwest of; 27 feet southeast of road coming into ranch from southwest, 400 feet southwest of junction with road from "18-mile" ranch, near north end of a circular outcrop of flat rock ⊱⊰ chiseled on top of southeast side of sandstone rock 5 by 3 by 1 foot.	4,791.45

LINE BEGINNING AT BENCH MARK 2 MILES EAST OF RICHARDSON'S RANCH, SOUTHWESTERLY BY M'BEATH'S RANCH DOWN EAST FORK OF HAWKWRIGHT CREEK, THENCE NORTHERLY TO BENCH MARK IN PASS CREEK VALLEY.

Richardson's ranch to Hawkwright Creek.

McBeath's ranch, 1.4 miles northeast of; 20 feet east of road to Custer, on south side of ridge of timber through which road passes, 6 feet east of dry sandy ravine, copper nail in root on northwest side of 15-inch pine tree	4,638.39
McBeath's ranch, 1,600 feet northeast of; 35 feet southeast of road to Custer on southwest edge of timber, 300 feet southwest of point where road runs down dry rocky stream bed; one pine tree, marked "U.S.G.S. B.M. W.T.," east 30 feet; iron post marked "DW 4512"	4,512.441
Cedar ranch, 1,300 feet northwest of; 370 feet south of gate in wire fence, 60 feet east of road; copper nail in root on west side of 15-inch dry pine snag 6 feet high	4,399.19
Cedar ranch, 500 feet west of; 140 feet west of gate in wire fence, 20 feet southwest of road; spike level with ground in root on northeast side of 12-inch pine tree	4,348.15

	Feet.
Cedar ranch, 2 miles south of; 20 feet west of road down Hawkwright Creek, 180 feet west of and about 30 feet above bed of east fork of Hawkwright, 600 feet north of point where road runs up out of valley and crosses ridge; two pine trees marked "U.S.G.S. B.M. W.T." Five inches diameter south 70 feet; 8 inches diameter west 40 feet; iron post marked "DW 4165"	4,165.390
Cedar ranch, 4 miles south of; 40 feet west of crossing of road over Hawkwright Creek, 500 feet south of spring; spike in root on south side of 15-inch cottonwood tree	4,033.71
Cedar ranch, 4¼ miles south of; 25 feet northeast of road down Hawkwright Creek, at junction with road coming in from northwest, about 3,000 feet south of the fork in creek, ¼ mile west of creek; iron post marked "DW 4021"	4,021.425
McBeath's ranch, 2½ miles west of; 70 feet northwest of road from McBeaths and Cedar ranches to Pass Creek, at junction with road coming up ridge from the southwest; on top of watershed between Pass Creek and Hawkwright Creek, point at which road starts descent into Pass Creek basin; pine tree 15 inches diameter marked "U.S.G.S. B.M. W.T." southeast 130 feet; iron post marked "DW 4373"	4,373.390

LINE FROM PASS CREEK VALLEY NORTHWARD TO MARSH'S RANCH.

Pass Creek, 1 mile north of; ¼ mile west of Roger's shack, 50 feet northwest of old "S. & G." and Custer county road, north side of belt of timber; spike in southeast side of 20-inch broken top pine tree 15 feet high	4,401.30
Roger's shack, 1¼ miles northeast of; 120 feet southeast of old "S. & G." and Custer county road, 25 feet northeast of plank gate in wire fence on south side of Lindsay's pasture; spike in root on north side of 2-foot pine tree	4,639.43
Lindsay's ranch, ¼ mile east of; 18 feet southeast of old "S. & G." and Custer county road, in small saddle on top of ridge, 40 feet northeast of crest, 600 feet south of fence on north side of pasture; two pine trees marked "U.S.G.S. B.M. W.T.;" 5 inches diameter northwest 60 feet, 12 inches diameter northeast 90 feet; iron post marked "DW 4801"	4,801.141
Lindsay's ranch, 1 mile northeast of; 8 feet west of old "S. & G." and Custer county road, northeast side of Lindsay's pasture; spike in north side of corner fence post	4,726.65
Lindsay's pasture, 4,000 feet north of northeast corner, 40 feet west of old "S. & G." and Custer county road, 450 feet north of junction with road from southwest, south side of belt of timber; wire spike in southeast side of 12-inch pine tree	4,857.21
Reynolds's ranch, about 1 mile southwest of; 120 feet southeast of old "S. & G." and Custer county road; wire spike in root on southeast side of 18-inch pine tree	5,153.21
Reynolds's ranch, ½ mile southwest of; 30 feet east of old "S. & G." and Custer county road, at junction of road coming in from southeast, ¼ mile south of point of fork of road to Reynolds's ranch; iron post marked "DW 5208"	5,208.292
Reynolds's ranch, 1.2 miles north of; 35 feet southeast of old "S. & G." and Custer county road, 165 feet northeast of cross roads in draw forming head of Pass Creek; copper nail in northwest side of 12-inch pine tree	5,305.06
Reynolds's ranch, 2 miles north of; 150 feet southeast of road to "Y 4" ranch, ¼ mile southwest of timbered butte; copper nail in northwest side of 2-foot pine tree	5,432.51

	Feet.
Reynolds's ranch, 2¼ miles north of; 20 feet east of road to "Y 4" ranch, ¼ mile northwest of timbered butte, near south end of a strip of prairie; two pine trees marked "U.S.G.S. B.M. W.T.," 6 inches diameter south 180 feet; 12 inches diameter northeast 260 feet; iron post marked "DW 5491"	5,491.264
Reynolds's ranch, 3¼ miles north of; 50 feet east of road to "Y 4" ranch, 160 feet southwest of gate in fence; wire spike in root on north side of 18-inch pine tree	5,488.17
"Y 4" ranch, ¼ mile southwest of; 30 feet north of road from Pass Creek, 25 feet east of ravine, 60 feet north of fence; wire spike in root on south side of 2-foot pine tree	5,515.96
"Y 4" ranch, 1,500 feet northeast of; 40 feet southeast of road to Custer, 40 feet east of corner of fence; wire spike in root on north side of 2-foot pine tree in bottom of dry ravine	5,484.45
"Y 4" ranch, ¼ mile northeast of; 20 feet southeast of road to Custer, in saddle on top of small ridge; 2 pine trees marked "U.S.G.S. B.M. W.T.," 5 inches diameter west 145 feet; 12 inches diameter northeast 200 feet; iron post marked "DW 5541"	5,541.189
"Y 4" ranch, 2½ miles northeast of; 10 feet southeast of road to Custer, 2,500 feet southwest of junction with old Custer and New Castle stage road; wire spike in root on north side of 18-inch pine tree	5,671.65

CUSTER WESTERLY ALONG CUSTER AND NEWCASTLE PUBLIC ROAD TO A POINT ABOUT ¾ MILE NORTH OF BABCOCK'S RANCH VIA FOUR MILE, MARSH'S RANCH, WARD'S RANCH, AND CROSSING HELL CANYON.

Custer, 1 mile west of; point of rock in top of ledge 3 feet from east end; south side of road at fence, 100 feet east of small ravine crossing road at right angles	5,350.03
Wright's ranch, 500 feet west of; nail in root of 5-inch pine tree on north side of road	5,378.15
Carr's ranch, 300 feet northeast of; 3 miles southwest of Custer, in spherical-shaped rock outcrop 100 feet southeast of road; W. T. 45 feet east, 30-inch pine; W. T. 30 feet south, 15-inch pine; bronze tablet marked "DW 5475"	5,475.289
Four Mile, Hendrick's ranch, 500 feet east of; 3 feet west of mile board at the intersection of the Dudley road with the Newcastle and Custer road, 4¼ miles southwest of Custer; iron post marked "DW 5336"	5,336.161
Four Mile, 1 mile west of; nail in root of 15-inch pine 40 feet south of road	5,453.73
Four Mile, 2 miles west of; ¼ mile east of Marsh's ranch; nail in root of 18-inch pine 40 feet south of road	5,473.77
Marsh's ranch, 800 feet west of; top of large flat rock on east edge of road, and level with road, in west bank of dry creek channel, 125 feet north of crossing; W. T. 70 feet east of south, pine, 30 inches diameter; W. T. 50 feet east of south, pine 30 inches diameter; bronze tablet marked "DW 5453"	5,453.268
Marsh's ranch, 1.2 miles west of; nail in root of 10-inch pine 25 feet south of road near where it starts up ridge	5,594.19
Ward's ranch, 1 mile east of; nail in top of 3-inch stump on south edge of road in top of ridge	5,730.17
Ward's ranch, 300 feet south of; 50 feet north of road; W. T. 30 feet east, 18-inch pine; W. T. 50 feet northeast, 18-inch pine; bronze tablet set in rock marked "DW 5614"	5,614.095
Ward's ranch, 1 mile west of; nail in root of 15-inch pine tree on south edge of road	5,596.48

	Feet.
Ward's ranch, 2 miles west of; 1 mile north of Smith's ranch, at junction of ravine with Hell Canyon on south edge of road, 75 feet east of road coming down Hell Canyon; W. T. 50 feet southeast 10-inch pine; W. T. 165 feet northeast 20-inch pine; bronze tablet marked "DW 5090"	5,090.196
Ward's ranch, 4 miles west of; nail in root of 12-inch pine 25 feet south of road	5,304.38
Ward's ranch, 5 miles west of; nail in 3-inch pine stump on south edge of road; south branch of road leaves Hell Canyon	5,259.84
Smith's ranch, 3 miles west of; 800 feet west of intersection of middle and south roads over Hell Canyon. On top of divide between west Hell Canyon and east prong of Tepee Canyon, limestone 3 by 2 by 1½ feet high, 100 feet northwest of road; W. T. 200 feet north, 15-inch pine; W. T. 65 feet southwest 12-inch pine; bronze tablet marked "DW 5358".	5,358.129
Smith's ranch, 4 miles west of; 18-inch pine south edge of road, half down hill to Tepee Canyon	5,171.69
Smith's ranch, 5 miles west of; nail in root of 12-inch pine, 25 feet north of road, 100 feet west of middle prong of Tepee Canyon	5,099.64
Smith's ranch, 6 miles west of; 25 feet south of road, 900 feet east of section corner, on line between ranges 1 and 2, near foot of ridge; W. T. 285 feet east, 20-inch pine; W. T. 250 feet northeast 24-inch pine; iron post marked "DW 5094"	5,094.142
Smith's ranch, 7 miles west of; nail in root of 18-inch pine on south edge of road	5,120.83
Smith's ranch, 8 miles west of; point on large flat rock on north edge of road, 300 feet west of top of ridge, ¼ mile west of road running to Babcock's ranch	5,043.32

LINE COMMENCING AT BENCH MARK ON THE CUSTER AND DEADWOOD PUBLIC ROAD, HALF MILE SOUTHEAST OF PLEASANT VIEW RANCH, HALF MILE NORTHEAST OF WRIGHT'S RANCH, AND 30 FEET SOUTHEAST OF ROAD FROM WRIGHT'S RANCH TO CUSTER, NORTHWESTERLY TO BENCH MARK NEAR JAMES DWYER'S RANCH.

Foran's ranch, ¼ mile north of; nail in root of 24-inch pine stump, 25 feet west of road at edge of park north of ridge, near road intersection	5,808.55
Foran's ranch, 1¼ miles north of; nail in root of dead 24-inch pine tree 60 feet west of road, 200 feet south of top of divide	6,059.94
Mahnke's ranch, ¼ mile south of; 35 feet west of intersection of old stage road from Custer to Deadwood and road running to Hill City via Tenderfoot; southeast of Junction schoolhouse ¼ mile; W. T. 120 feet northeast 15-inch pine tree; W. T. 120 feet northeast 18-inch pine tree; iron post marked "DW 6106"	6,106.090
Mahnke's ranch, 0.6 mile north of; nail in top of 3-inch quaking aspen stump, 25 feet west of road, where it turns up prong of creek	5,952.70
Mahnke's ranch, 1¼ miles north of; nail in root of 12-inch pine tree, 10 feet east of road	6,030.71
Vonderlehr's ranch, 275 feet north of; on east side of road where it turns northwest on north side of valley; W. T. 120 feet northwest, 24-inch pine tree; W. T. 300 feet northeast 24-inch pine tree; iron post marked "DW 5818"	5,818.081
Vonderlehr's ranch, 1.2 miles north of; nail in root of 8-inch pine tree on west edge of road, 150 feet south of top of ridge	6,135.86
Vonderlehr's ranch, 2 miles north of; nail in root of 24-inch pine tree, 20 feet east of road, 300 feet north of top of ridge at Spring Creek	5,942.15
Jackson's ranch, 800 feet west of; at west edge of road, 100 feet west of small creek; W. T. 170 feet northeast 30-inch pine tree; W. T. 265 feet northwest 36-inch pine tree; iron post marked "DW 5833"	5,833.068

	Feet.
Jackson's ranch, 1¼ miles north of; nail in root of 10-inch pine tree 50 feet west of road	5,948.15
Simpson's ranch, 400 feet northeast of; in rock outcrop on point of ridge on east side of road; W. T. 85 feet west, 18-inch pine; W. T. 35 feet north, 15-inch pine; bronze tablet marked "DW 6123"	6,122.971
Simpson's ranch, 1 mile north of; nail in root of pine on southwest edge of road on top of ridge	6,428.46
Gillette's ranch, 350 feet east of; in rock outcrop 20 feet long, 4 feet high, 15 feet above and 25 feet northeast of road at angle of; 175 feet northwest of bridge over Slate Creek; W. T. 370 feet south, 24-inch pine; bronze tablet marked "DW 6243"	6,243.153
Gillette's ranch, 1.1 miles north of; top of triangular stone 18 inches high with 2 feet base, 40 feet west of road, 75 feet east of Slate Creek	6,105.59
Cramer's ranch, 0.4 mile north of; 20 feet south of road forks; W. T. 325 feet northeast 36-inch pine; W. T. 425 feet southwest 30-inch pine; iron post marked "DW 5901"	5,900.973
Jim Dwyer's ranch, 0.4 mile south of; nail in top of 3-inch pine stump, 25 feet east of road, 20 feet west of ravine	5,912.09

DWYER'S RANCH EAST OF TIGERVILLE ON BURLINGTON AND MISSOURI RIVER RAILROAD.

Jim Dwyer's ranch, 800 feet northwest of; 275 feet north of road, set for township corner on base line and marked "SCT 1 N., R. 3 E., on NW. and R. 4 E. on NE.;" iron post marked "DW 5837"	5,837.498
Jim Dwyer's ranch, 1 mile east of; nail in root of 10-inch pine tree south of road	5,861.95
Jim Dwyer's ranch, 2 miles east of; nail in stump of quaking aspen, 15 feet south of road, in aspen thicket	5,737.93
Cronin's ranch, 500 feet east of; nail in root of 8-inch pine tree, 25 feet north of road	5,582.48
Mrs. Dwyer's ranch, or Tigerville; nail in root of 24-inch pine tree, 100 feet east of road intersection	5,485.12

LINE COMMENCING 1¼ MILES SOUTHEAST OF BEAR SPRINGS ON ROAD FROM CUSTER TO BEAR SPRINGS, PREACHER SPRINGS, AND HEAD OF CASTLE CREEK, THENCE NORTHERLY TO DEADWOOD AND NEWCASTLE ROAD, THENCE EASTERLY TO BULLDOG RANCH ON BURLINGTON AND MISSOURI RIVER RAILROAD.

Bear Springs, 1 mile south of; nail in root of old pine snag 25 feet west of road	6,451.23
Bear Springs, in flat limestone outcrop 12 by 15 feet, 130 feet east of creek, 500 feet southeast of cabin, 50 feet below timber line, 350 feet southeast of road, 600 feet northeast of road; W. T. 400 feet northwest 18-inch pine tree; W. T. 250 feet northeast 40-inch pine tree; copper bolt marked "DW 6490"	6,490.244
Bear Springs, 1 mile north of; nail in root of 5-inch pine stump, 15 feet east of road	6,657.90
Bear Springs, 2¼ miles north of; in center and upper side of flat limestone outcrop, 135 feet northeast of road, on top of divide between head of Gillette Canyon and Hell Canyon, outcrop 60 feet by 30 feet; W. T. 175 feet south 15 inch pine tree; W. T. 310 feet northwest 12-inch pine tree; copper bolt marked "DW 6912"	6,912.3
Bear Springs, 3 miles northwest of; nail in root of 10-inch pine tree, 75 feet north of road	6,765.42
Bear Springs, 3¼ miles northwest of; nail in root of 15-inch pine tree, 75 feet north of road	6,664.68

	Feet.
Bear Springs, 4 miles northwest of; 25 feet east of road running from Gillette Canyon to Bear Springs, on southeast side of Gillette Park at foot of ridge which divides the branch of Gillette Canyon running toward Bear Springs from one running to head of Spring Creek, 800 feet south of the intersection of the two branches of Gillette Canyon, near the indefinite intersection of the roads running to Bear Springs, Spring Creek, down Gillette Canyon and north through Gillette Park; W.T. 190 feet northeast 20-inch pine tree; W.T. 400 feet southeast 30-inch pine tree; iron post marked "DW 6611"	6,611.230
Preacher Springs main road and Gillette Canyon road, 5.1 miles east of intersection of; highest point of rock 12 by 12 inches 30 feet south of road	6,560.56
Preacher Springs main road and Gillette Canyon road, 4 miles east of intersection of; nail in root of 24-inch pine tree, 150 feet north of road	6,462.02
Preacher Springs main road and Gillette Canyon road, 3 miles east of intersection of; at intersection with a ravine from the south with Gillette Canyon; in second limestone outcrop from the north, at foot of cliff and 40 feet south of northwest point of cliff; 5 feet above level of surface, outcrop 10 feet high; W.T. 280 feet north 30-inch pine tree; W.T. 300 feet southwest 24-inch pine tree; copper bolt marked "DW 6374"	6,374.051
Preacher Springs main road and Gillette Canyon road, 2 miles east of intersection of; nail in top of 4-inch pine stump 100 feet south of road	6,298.45
Preacher Springs main road and Gillette Canyon road, 1 mile east of intersection of; nail in root of 18-inch pine tree 50 feet east of road	6,207.86
Preacher Springs main road and Gillette Canyon road, 0.3 mile west of intersection of; in east end and 8 inches below top of limestone outcrop 5 feet long and 2 feet high, 75 feet north of road and 6 feet higher than road; W.T. 25 feet north, 18-inch pine tree; W.T. 125 feet northeast, 24-inch pine; copper bolt marked "DW 6129"	6,129.241
Graham ranch road and Preacher Springs-Buck Springs road, 2 miles east of intersection of; nail in root of 14-inch pine tree, 30 feet east of road.	6,059.71
Graham ranch road and Preacher Springs-Buck Springs road, 1 mile northeast of intersection of; nail in root of 24-inch dead pine tree, 20 feet east of road	5,963.79
Graham ranch road and Preacher Springs-Buck Springs road, 25 feet west of intersection of; 4 miles east of Graham's ranch; W.T. 45 feet north, 30-inch pine; W.T. 125 feet northeast, 30-inch pine; iron post marked "DW 6167"	6,167.223
Graham's ranch, 3 miles east of; nail in root of 18-inch pine tree, 20 feet west of road	6,221.20
Graham's ranch, 2 miles east of; nail in root of 12-inch pine tree south of road	6,201.96
Graham's ranch, 1 mile east of; nail in root of 15-inch pine tree, on south side of road	6,091.69
Graham's ranch, 1,000 feet south of; in blue limestone outcrop 12 by 12 inches, 15 feet east of road on east side of Hay Canyon, 20 feet east of foot of hill; W.T. 135 feet north, 24-inch pine tree; W.T. 280 feet southeast, 30-inch pine tree; copper bolt marked "DW 5752"	5,752.294
Moon's ranch, 2 miles south of; nail in root of 10-inch pine tree, 10 feet north of road	6,041.67
Moon's ranch, 1¼ miles south of; nail in root of 18-inch dead pine tree, 45 feet east of road	6,146.27
Moon's ranch, 65 feet south of cabin; in limestone outcrop 18 by 24 inches; W.T. 170 feet north, 10-inch pine tree; W.T. 85 feet west, 24-inch pine tree; copper bolt marked "DW 6273"	6,273.532

	Feet.
Moon's ranch, ¼ mile north of; nail in root of 24-inch pine tree, 65 feet east of road	6,335.83
D. W. Thompson's ranch, 2¼ miles south of; nail in root of 40-inch pine tree 75 feet east of road	6,403.37
D. E. Thompson's ranch, 1¼ miles south of; nail in root of 30-inch pine tree 50 feet west of road	6,386.09
D. W. Thompson's ranch, 0.7 mile south of; 25 feet east of intersection of road running south with Newcastle road; W. T. 50 feet east, 12-inch pine tree; W. T. 265 feet southwest, 18-inch pine tree; iron post, marked "DW 6480"	6,480.210
D. W. Thompson's ranch, ¼ mile south of; nail in root of 15-inch pine tree, 90 feet east of road	6,511.27
D. W. Thompson's ranch, 0.8 mile east of; nail in root of 12-inch pine tree, 20 feet south of road	6,673.08
D. W. Thompson's ranch, 1¼ miles east of; in limestone outcrop, 24 by 18 feet, 6 feet higher than road, 40 feet southeast of intersection of Preacher Springs road with Newcastle road; W. T. 250 feet west, 36-inch pine tree; W. T. 185 feet southeast, 18-inch pine tree; copper bolt, marked "DW 6588"	6,588.185
Woodward's ranch, 4 miles south of; on top of divide, nail in stake, 6 inches above ground, west of road	6,683.15
Woodward's ranch, 3¼ miles south of; point of rock by stake, 15 feet east of road	6,597.43
Woodward's ranch, 2¼ miles south of; highest point of stone, 2 feet by 1 foot, 40 feet east of road, stake by stone	6,568.73
Woodward's ranch, 1¼ miles south of; 1,000 feet southeast of Scott's unfinished cabin, 6 inches below top of limestone outcrop, 200 feet southwest of spring; W. T. 15 feet southeast, 10-inch pine; W. T. 125 feet west, 10-inch pine; copper bolt marked "DW 6681"	6,681.238
Woodward's ranch, ¼ mile south of; nail in root of 8-inch dead tree, 125 feet east of road on top of ridge	6,770.72
Ketelle ranch, nail in stake 10 feet northwest of intersection of road leading to Ketelle ranch and main road	6,677.26
Castle Creek, head of; in west side and 2 feet below top of limestone outcrop, 10 by 10 feet, 150 feet northeast of intersection of the Castle Creek, Cold Springs, and Newcastle roads; W. T. 150 feet north, 18-inch pine tree; W. T. 200 feet east, 18-inch pine tree; copper bolt, marked "DW 6536"	6,536.045
Castle Creek, head of, below intersection of roads; 120 west of road running down creek; nail in quaking aspen stump	6,523.32
Silver Tip Spring, 1 mile south of; nail in balsam stump, 150 feet east of road	6,672.52
Silver Tip Spring, 200 feet southwest of; 500 feet southwest of Dolan's ranch; nail in stump west of road	6,817.36
Thowel's and Smith's ranches, 50 feet southwest of intersection of road running east to; nail in quaking aspen stump 25 feet west of road	6,769.77
Cold Springs, 1.9 miles south of; nail in balsam stump 85 feet west of road.	6,706.69
Cold Springs, ¼ mile south of; nail in quaking aspen stump 50 feet west of road	6,525.58
Cold Springs, 300 feet north of; in limestone ledge 15 feet higher than creek bed, 150 feet north of where Cheyenne–Deadwood road crosses creek, 100 feet west of road, 200 feet west of road running south to head of Castle Creek; ledge shows out of ground 10 feet in length and 2 feet high; copper bolt marked "DW 6417"	6,416.999
Cold Springs Creek, road strikes creek and turns south; nail in quaking aspen stump, 150 feet northeast of creek	6,307.86

	Feet.
McQuaig road and Cheyenne–Deadwood road, 4 miles west of intersection of; near top of high ridge, nail in root of charred pine snag, 20 feet high, 75 feet east of road	6,562.31
McQuaig road and Cheyenne–Deadwood road, 3½ miles west of the intersection of; nail in quaking aspen stump, 50 feet south of road, in quaking aspen thicket on side of hill	6,612.13
McQuaig, 125 feet northeast of log stable; nail in root of large pine tree, 40 feet south of road	6,363.9
McQuaig road and Cheyenne–Deadwood road, 2.7 miles north of intersection of; 0.8 mile south of McQuaig; nail in quaking aspen stump east of road	6,370.6
McQuaig road and Cheyenne–Deadwood road, 1.7 miles north of intersection of; nail in root of big pine tree 60 feet east of road	6,486.8
McQuaig road and Cheyenne–Deadwood road, 1 mile north of intersection of; nail in root of pine tree east of road	6,565.7
McQuaig road and Cheyenne–Deadwood road, 2½ miles west of intersection of; nail in quaking aspen stump, on north side of stump, on north side of road at edge of timber	6,684.65
McQuaig road and Cheyenne–Deadwood road, 1½ miles west of intersection of; nail in quaking aspen stump, 75 feet south of road, in quaking aspen thicket	6,572.54
McQuaig road with Cheyenne–Deadwood road, intersection of; 2 miles west of Colton's ranch, in shelf of limestone cliff, 3 feet below top of cliff on the part farthest south and west; cliff 10 feet high and 15 feet long, on south bank dry creek channel, 100 feet south of the road intersection; copper bolt marked "DW 6464"	6,464.513
Colton's ranch, 1½ miles west of; nail in balsam stump, south edge of road, crossing of dry creek channel	6,394.97
Colton's ranch, 800 feet west of; nail in side of big pine tree, 20 feet north of road	6,298.65
Bessant's ranch, 3 miles west of; nail in top of quaking aspen stump, on west side of road	6,429.75
Bessant's ranch, 2½ miles west of; nail in root of spruce tree at end of fence	6,547.02
Bessant's ranch, 2 miles west of; nail in root of pine tree on north edge of highway	6,589.96
Bessant's ranch, 1 mile south of; nail in balsam stump on south edge of highway at big angle in road	6,472.11
Bessant's ranch, 500 feet southeast of dwelling; nail in top of stump at angle in road	6,439.50
Bessant's ranch, ¼ mile east of; nail in root of pine snag north of road	6,410.26
Howell's ranch; nail in root of pine stump north of road	6,357.46
Fish's timber camp; nail in root of pine tree used as fence corner, 100 feet southeast of dwelling	6,284.38
Bull Dog ranch, 3 miles west of; ¼ mile west of abandoned sawmill; nail in root of pine stump east of road on top of ridge, 1,000 feet southeast of Limestone Butte	6,299.51
Bull Dog ranch, 2½ miles west of; nail in root of spruce tree, 300 feet south of dwelling at abandoned sawmill, 20 feet east of wire fence at road intersection	6,062.69
Bull Dog ranch, 1½ miles west of; nail in root of pine stump, south edge of highway at intersection of logging road	6,097.12
Bull Dog ranch, 0.7 mile west of; nail in root of balsam tree at edge of timber	5,963.52

LINE COMMENCING NEAR INTERSECTION OF ROADS TO PREACHER SPRINGS, TO DITCH CREEK, TO SPRING CREEK, AND TO BEAR SPRING; THENCE NORTHERLY TO HEAD OF WATER IN DITCH CREEK.

	Feet.
Bear Spring, 5 miles northwest of; 2¾ miles southeast of head of water in Ditch Creek; highest point of black bowlder, 18 inches diameter, with corner broken off, 12 feet east of road, 100 feet southeast of limestone outcrop, 300 feet north of top of ridge	6,598.06
Bear Spring, 5¼ miles northwest of; 2¼ miles southeast of head of water in Ditch Creek; 2 feet northeast of ¼ section corner common to the corner of the SE. ¼ and SW. ¼ of sec. 36, T. 1 S., R. 2 E., and the NE. ¼ and NW. ¼ of sec. 1, T. 2 S., R. 2 E., 100 feet west of road, 25 feet east of dry creek; W. T. 425 feet southwest, pine 15 inches diameter; W. T. 550 feet southwest, pine 24 inches diameter; iron post marked "DW 6571".	6,571.257
Bear Spring, 6 miles northwest of; 1¾ miles southeast of head of water in Ditch Creek; nail in root of dead pine tree on edge of dry creek 300 feet west of road	6,525.16
Bear Spring, 7 miles northwest of; ¾ mile southeast of head of water in Ditch Creek; nail in top of balsam stump 3 inches diameter, 65 feet west of road on west bank of dry creek	6,458.54
Ditch Creek, head of water in; in limestone outcrop 10 by 10 feet square, 2 feet high, 85 feet east of road and 15 feet higher than road, 400 feet south of spring at head of Ditch Creek; W. T. 180 feet northeast, pine tree 24 inches diameter; W. T. 280 feet west, pine tree 15 inches diameter; bronze tablet marked "DW 6410"	6,410.206

BULL DOG RANCH, ON BURLINGTON AND MISSOURI RIVER RAILROAD, THENCE EASTERLY TO NASBY.

Bull Dog ranch, 1 mile east of; nail in root of large pine tree in middle of road	6,006.62
Bull Dog ranch, 1¼ miles east of; nail in pine stump 50 feet east of highway, dead tree blazed at west edge of highway	6,054.68
Bull Dog ranch, 1½ miles east of; nail in top of pine stump 25 feet south of intersection of Custer Peak and Rapid City roads	6,019.21
Bull Dog ranch, 2 miles east of; nail in root of quaking aspen tree 125 feet southeast of log stable	5,888.10
Bull Dog ranch, 3 miles east of; nail in root of large pine tree on south edge of highway 150 feet east of log house	5,816.18
Dayton's ranch, 0.4 mile east of; nail in root of large pine tree on ridge south side of highway, 50 feet north of fence	5,728.61
Dayton's ranch, 1¼ miles east of; nail in pine stump on ridge north of highway, 75 feet north of wire fence	5,645.31
Rassmussen's ranch, 270 feet east of; nail in root of pine snag 20 feet high, on north side of highway	5,535.64
Rassmussen's ranch, ¼ mile east of; nail in root of pine tree 20 feet from gate	5,491.95
Nasby; nail in top of stake 8 inches under surface, 2 feet south of fence post, east side of highway at foot of hill 300 feet southeast of dwelling.	5,415.61
Nasby; 200 feet north of dwelling, 50 feet northwest of road intersection; iron post marked "DW 5456"	5,456.118

NASBY TO MERRITT.

Nasby, 1 mile southeast of; nail in top of 4-inch pine stump, northeast side of road	5,447.58
Fredrickson's ranch; 100 feet northeast of road intersection, 25 feet north of Greenwood road; nail in root of 12-inch pine	5,331.08

	Feet.
Peterson's ranch; 150 feet east of dwelling, on west side of road; iron post marked "DW 5322"	5,322.102
Peterson's ranch, 1 mile southeast of; nail in root of 15-inch pine, 20 feet west of road, 800 feet south of top of ridge	5,393.26
Peterson's ranch, 2 miles southeast of; nail in root of 15-inch pine, southeast side of road	5,263.83
Merritt, 0.8 mile west of; stone at fence corner northwest of intersection of Silver City and Merritt roads; point 1 inch west of piece of white quartz in northwest end of stone	5,133.94
Merritt post-office; 60 feet northeast of ranch on north side of road; iron post marked "DW 5059"	5,059.140

BRIDGE NO. 74 OF BURLINGTON AND MISSOURI RIVER RAILROAD, 1¼ MILES NORTHEAST OF MYSTIC; THENCE EASTERLY TO SILVER CITY AND PACTOLA.

Castle Creek; 150 feet west of junction with Rapid Creek, 35 feet north of small highway bridge over Rapid Creek, 40 feet east of cabin; wire nail in southeast side of 18-inch pine stump	4,770.52
Castle Creek, mouth of; surface of water	4,761
Castle Creek, 4,500 feet southeast of mouth; 40 feet south of small highway bridge over Rapid Creek, 12 feet west of south end of high trestle bearing flume, 10 feet southeast of wagon road; point on west face of columnar rock 18 inches above ground	4,724.86
Silver City, 3 miles west of; 600 feet east of Canyon City, 2 feet southeast of county road, 30 feet northwest of Rapid Creek, 8 inches above ground; in northeast corner of north post in long trestle carrying flume	4,698.89
Silver City, 2¾ miles west of; 5 feet north of road up Rapid Creek, 30 feet west of junction with road from Merritt, on southeast corner of high point of rock, on small shelf 2½ feet above road; three pine trees marked "U.S.G.S. B.M. W.T.," as follows: 2½ feet in diameter east 120 feet, 15 inches diameter northeast 100 feet, 1 foot diameter north 65 feet, spruce 1 foot diameter west 145 feet; bronze tablet marked "DW 4698"	4,698.028
Silver City, 1.6 miles west of; 40 feet southwest of highway bridge over Rapid Creek at mouth of deep gulch coming in from the southwest; spike in root west side of 18-inch spruce tree	4,658.98
Silver City, 2,500 feet west of; 120 feet southwest of Querpel's cabin, 100 feet east of highway bridge across Rapid Creek; copper tack in root southwest side of 18-inch pine stump	4,627.13
Silver City post-office, 1,200 feet east of; 110 feet southwest of highway bridge over Rapid Creek, 15 feet southwest of junction of road down Nugget Gulch with road down Rapid Creek; iron post marked "DW 4592"	4,592.033
Silver City post-office, 1.9 miles east of; at mouth of Jenny Gulch, 220 feet east of highway bridge over Rapid Creek, 40 feet northeast of highway bridge over ditch, 200 feet east of head gates; spike in north side of 15-inch pine tree	4,546.08
Pactola, 1.8 miles west of; 15 feet southwest of road to Silver City, 350 feet northwest of junction with road running up Bear Gulch, 220 feet north of house; two pine trees marked "U.S.G.S. B.M. W.T.," as follows: 20 inches diameter southeast 35 feet, 2½ feet diameter west 25 feet; iron post marked "DW 4518"	4,517.971
Pactola; junction of road from Rapid City with roads from Hill City and Silver City, 3 feet south of corner 15, M. C. 891; iron post marked "DW 4459"	4,458.943

PACTOLA, NORTHWEST TO MERRITT.

	Feet.
Pactola, 1.2 miles northwest of; 50 feet southwest of road to Merritt, 80 feet east of plank fence at top of steep hill; spike in west root of 15-inch pine tree	4,741.18
Traft's ranch, 900 feet southeast of; 150 feet from top of divide between Rapid and Deer creeks, 20 feet southwest of road from Pactola to Merritt; spike in root on north side of 15-inch pine tree	4,885.08
Pactola, 3 miles northwest of; ¼ mile northwest of Hughes's ranch, 35 feet southwest of road from Pactola to Merritt, 190 feet northwest from fork in road; two witness trees marked "U.S.G.S. B.M. W.T.," 6 inches diameter northwest 180 feet, 12 inches diameter northwest 200 feet; iron post marked "DW 4934"	4,934.145
Ireland's ranch, 500 feet northwest of; 25 feet southwest of road from Pactola to Merritt; spike in root northwest side of 2½-foot pine tree	5,052.77
Merritt post-office (Jones's ranch), 3,000 feet southeast of; in fork of road from Pactola to Merritt, 8 feet below and 140 feet northwest of top of divide between Jim and Deer creeks; large wire spike in root southeast side of 13-inch pine tree	5,195.78

MERRITT, EASTERLY DOWN JIM CREEK AND UP BOX ELDER CREEK TO NEMO.

Merritt post-office, ¼ mile northeast of; 4 feet south of road down Jim Creek 350 feet east of fence; wire nail in west side of 20-inch pine tree	4,996.05
Merritt post-office, 2½ miles northeast of; 25 feet south of wagon road down Jim Creek, 65 feet south of old cabin 330 feet east of fence; wire nail in root north side of 2½-foot pine tree	4,821.65
Merritt post-office, 3½ miles east of; 500 feet south of old sawmill, 30 feet north of road down Jim Creek, tree used as southwest gatepost in wire fence; spike in root south side	4,744.25
Riley's ranch (on Bogus Jim Creek), ¼ mile northwest of; 8 feet southwest of timber road, in saddle on top of divide between Jim Creek and Bogus Jim Creek; spike in root south side of 12-inch pine tree	4,774.62
Riley's ranch (on Bogus Jim Creek), 2,000 feet northwest of; 10 feet southeast of road from Merritt, center of top of rock 8 by 7 by 2 feet; three pine trees marked "U.S.G.S. B.M. W.T.," 24-inch diameter northeast 75 feet, 12-inch diameter north 75 feet, 18-inch diameter northwest 30 feet; copper bolt marked "DW. 4801"	4,800.933
Jim Creek, 1,500 feet northeast from mouth of; 190 feet north of highway bridge over Box Elder Creek; in east corner of flat tabular rock 15 by 25 by 4 feet; three pine trees marked "U.S.G.S. B.M. W.T.," as follows: 18-inch diameter southwest 36 feet, 15-inch diameter northwest 36 feet, 18-inch diameter northeast 20 feet; bronze tablet marked "DW. 4413"	4,412.886
Estes's ranch, 1½ miles southeast of; 1,800 feet northwest of Elliott's sawmill at west end of highway bridge over Box Elder Creek; spike in root east side of 2-foot pine tree	4,457.43
Estes's ranch, 150 feet northwest of dwelling, 12 feet northeast of county road up Box Elder Creek, 30 feet northwest of junction with road running down Estes Creek; spike in south root of 18-inch pine	4,563.41
McDonald's ranch, 575 feet northwest of; 15 feet west of county road up Box Elder Creek at junction with private road from McDonald's ranch; three witness trees marked "U.S.G.S. B.M. W.T.," 18-inch diameter north 70 feet, 18-inch diameter southeast 20 feet, 12-inch diameter southwest 45 feet; iron post marked "DW. 4614"	4,613.841

	Feet.
Nemo post-office, ¼ mile southeast of; 35 feet northeast of road down Box Elder Creek, 900 feet northeast of bridge over Box Elder Creek, 18-inch pine tree on rocky point; spike in west root	4,652.17

NEMO TO NASBY VIA GREENWOOD.

Nemo post-office, 500 feet northwest of; 10 feet southwest of road to Greenwood on top of slight ridge; spike in root northwest side of 2-foot pine tree	4,704.72
Nemo post-office, 3,500 feet northwest of; at junction of road from Greenwood with road from Elk Creek; spike in root of 15-inch pine	4,738.77
Greenwood, 2 miles southeast of; 10 feet northeast of road to Nemo, at junction of county road from Elk Creek to Nemo; three pine trees marked "U.S.G.S. B.M. W.T." 20-inch diameter southeast 105 feet, 20-inch diameter northwest 35 feet, 18-inch diameter southwest 70 feet; iron post marked "DW 4786"	4,785.788
Greenwood, 1 mile southeast of; on top of divide between Greenwood and Nemo; 8 feet north of county road; spike in east root of 18-inch pine	4,995.71
Greenwood, 100 feet southeast of large dwelling; at northwest corner of highway bridge over Box Elder Creek; spike in root north side of 18-inch pine tree	4,923.10
Greenwood, 1.1 miles northwest of; 30 feet west of road to Deadwood at point where timber road turns off for Nasby, across road from group of old log cabins, 250 feet northwest of highway bridge over Box Elder Creek; two pine trees marked "U.S.G.S. B.M. W.T.," 15-inch pine southeast 18 feet, 2-foot diameter northeast 40 feet; iron post marked "DW 5020"	5,019.813
Johnson's ranch, 1¼ miles northeast of; 6 feet northwest of county road; 150 feet northeast of road crossing over Box Elder Creek; spike in root southwest side of 15-inch pine tree	5,099.77
Anderson's ranch, 1,000 feet southeast of; 10 feet southwest of road; iron post marked "DW 5204"	5,203.758
Nelson's ranch, 2,000 feet southwest of; 60 feet southeast of road, 180 feet southwest of forks in road running south across Box Elder Creek; spike in north root of 2-foot pine	5,288.73

SOUTHWESTERN COLORADO.

LA PLATA, SAN JUAN, AND DOLORES COUNTIES.

ENGINEER MOUNTAIN QUADRANGLE.

The elevations given below are based on a bronze tablet set in the foundation of the Smelter State Bank building, Durango, marked "6517." The elevation of this datum, as derived from the corrected Denver and Rio Grande Railroad levels, is accepted as 6,517.003 feet above mean sea level.

The leveling was done under the direction of Mr. W. M. Beaman, topographer, by Mr. A. L. Fellows, levelman.

The bench marks dependent on this datum are stamped with the letters "DUR," in addition to the figures of elevation.

Leveling in Colorado was carried on in two localities. One was the vicinity of Rockwood, La Plata, and San Juan counties, and was dependent upon the Durango datum. The results of this leveling are

listed below. The second locality was the vicinity of Denver and Greeley. The results of this latter work will not be published until next year, as the transcontinental line of precise levels being run by the United States Coast and Geodetic Survey is expected to reach Denver in a few months, and it is deemed desirable to defer publication of these elevations until they can be referred to more accurate mean sea level as determined by such precise leveling.

ROCKWOOD AND SILVERTON WAGON ROAD FROM 5.8 MILES NORTH OF ROCKWOOD RAILROAD STATION TO SUMMIT IN ROAD (COAL BANK HILL) 5 MILES NORTH OF CASCADE CREEK.

	Feet.
Rockwood Railroad station, 5.8 miles north of, west side of road opposite north end of low limestone butte; limestone bowlder, 2 by 1 feet, 12 feet west of road about two-thirds way up steep hill, 25 feet southeast of blazed quaking aspen and 520 feet south of fence corner (east side); mark, a chiseled circle	8,602.87
Rockwood Railroad station, 6 miles north of, on limestone bowlder 2 by 3.5 feet, about 200 feet southeast of log cabin, 4 feet west of center of road; road forks 10 feet south, fence 35 feet east; mark, a chiseled square	8,703.24
Rockwood Railroad station, 6.6 miles north of, in aspen grove midway between two parks; limestone bowlder, 2 by 4 feet, 5 feet west of road, at foot of steep hill sloping to the north, 12 feet northwest of 8-inch blazed aspen 70 feet south of fence corner; mark, a chiseled square	8,799.58
Rockwood, 7.6 miles north of; 24-inch cottonwood tree 16 feet west of road, 175 feet southeast of Thomas Mahon's ("Old Butter Ranch"), 300 feet south of Elbert Creek, 8 feet southwest of 24-inch spruce; mark, a nail.	8,792.18
Rockwood, 7.6 miles north of, 30 feet west of road in fence corner, 375 feet south of Elbert Creek, 80 feet southeast of T. Mahon's ("Butter Ranch"); iron post stamped "DUR 8795"	8,795.258
Elbert Creek, ford of	8,792
Rockwood, 8.1 miles north of; center of road at top of hill north of Elbert Creek	8,908
Rockwood Railroad station, 8.4 miles north of, 50 feet southwest of Castle Rock Spring; sandstone bowlder, 3 by 1.5 feet, 20 feet west of road; mark, a chiseled square	8,881.69
Castle Rock Spring, road over	8,877
Castle Rock Spring, ¼ mile north of; summit in road	8,943
West ranch, foundation of house	8,819
Columbine Lake	8,788
Rockwood railroad station, 9.5 miles north of, ⅛ mile south of main road forks; sandstone bowlder, 2.5 by 4 feet, 15 feet east of road and 100 feet southwest of small pond; mark, a chiseled square	8,826.88
Rockwood railroad station, 9.5 miles north of; small pond east of road	8,816
Rockwood railroad station, 9.7 miles north of; road forks (to Hermosa Park or Silverton)	8,832
Road forks, to Hermosa Park or Silverton, 0.8 mile north of; floor of bridge	8,732.7
Road forks, to Hermosa Park or Silverton, 0.8 mile north of; 400 feet southeast of three cabins, 200 feet south of corral and 300 feet northwest of small bridge; nail in 12-inch spruce 15 feet east of road	8,754.32
Road forks, to Hermosa Park or Silverton, floor of 18-foot log bridge, 1¼ miles north of	8,740
Road forks, to Hermosa Park or Silverton, 2 miles north of; 400 feet west of two small ponds in meadow; nail in 20-inch spruce, 15 feet west of road	8,833.02

Feet.

Cascade Creek bridge, 0.4 mile southeast of; foundation of Wood's cabin. 8,818

Cascade Creek bridge, 45 feet north of north end of; granite rock, 3 by 4 feet, 20 feet west of center of road; copper bolt marked "DUR 8721".. 8,720.519

Cascade Creek bridge, 1.6 miles northeast of; 25 feet south of road, 460 feet south of sandstone butte, and 50 feet southwest of sharp bend in road; nail in 8-inch quaking aspen 9,369.28

Cascade Creek bridge, 2.6 miles north of; 14 feet west of road, 50 feet northwest of log bridge; road is here nearly level for 300 feet and in timber; nail in 12-inch spruce 9,787.25

Cascade Creek bridge, 3.5 miles north of; floor of 27-foot log bridge over dry wash 10,000.8

Cascade Creek bridge, 3.5 miles north of; 8-inch spruce stump, 2 feet high, 7 feet south of road, and 75 feet east of bridge, in heavy timber; mark, a nail 10,005.8

Cascade Creek bridge, 3.6 miles north of lowest point in road east of bridge 9,988

Cascade Creek bridge, 4.4 miles north of, and ¼ mile south of summit of Coal Bank hill; 11-inch spruce 12 feet southwest of road at upper bend in big "S" in road; mark, a nail 10,387.70

Cascade Creek bridge, 5 miles north of; diamond-faced limestone rock, 3 by 3 feet, 8 feet north of road, 14 feet west of 24-inch spruce stump, and 75 feet south of summit of Coal Bank hill; mark, a copper bolt marked "U.S.G.S., B.M. 10654 ft" 10,654.02

Coal Bank hill, summit in road 10,655

ROCKWOOD AND SILVERTON WAGON ROAD TO HERMOSA PARK.

Road forks to Hermosa Park or Silverton, 0.4 mile northwest of; at top of first hill, 3 feet from north edge of outcrop and 25 feet north of road; chiseled square on flat sandstone ledge 8,965.27

Road forks to Hermosa Park or Silverton, 1 mile northwest of; granite bowlder, 1.5 by 1.5 feet, 6 feet west of road, and 15 feet south of center of small bridge; mark, a chiseled square 9,269.12

Summit in road between Hermosa Park and Rockwood and Silverton wagon road, 2 by 2 feet sandstone bowlder, 10 feet south of 12-inch spruce; copper bolt marked "DUR 9805" 9,804.909

Hermosa Park, 4.3 miles east of, at head of east fork under bars over road at edge of woods and foot of hill 9,412

Hermosa Park, 4.7 miles east of; limestone bowlder 4 by 1 foot, 4 feet south of road, 60 feet east of bridge, 500 feet southwest of cabins, and 8 feet north of 7-inch blazed aspen; mark, a chiseled square 9,397.85

Hermosa Park, 4 miles east of, at old tollgate; foundation of cabin 9,334

Hermosa Park, 3½ miles east of; lower corner of diamond-shaped limestone bowlder, 5 by 5 feet, 12 feet north of road at lowest point and 100 feet south of ledge; mark, a chiseled square 9,300.01

Hermosa Park, 2½ miles east of; granite rock, 2 by 2 feet, 8 feet north of road, 800 feet east of small stream crossing, and 600 feet northeast of old cabin; mark, a chiseled square 9,200.40

Hermosa Park, 1.4 miles east of; stream crossing just west of old stage station 9,016

Hermosa Park, 1.4 miles east of, 3 feet from south end of; sandstone ledge 6 feet east of 12-inch spruce, 25 feet north of road, 80 feet west of stream crossing, and 300 feet southwest of old stage station 9,021

Hermosa Park, 1 mile east of; red sandstone ledge, 7 by 7 feet, 2 feet above ground, 12 feet south of center of road, and 300 feet west of foot of steep rocky hill; copper bolt marked "DUR 8898" 8,898.388

	Feet.
Hermosa Park, ¼ mile east of; ground at forks of old and new Rico roads.	8,838
Hermosa Park, floor of bridge over Hermosa Creek	8,797
Hermosa Park, center of; 50 feet southwest of bridge over Hermosa Creek at top of west bank, ¼ mile north of junction of east fork; iron post marked "DUR 8807"	8,807.148

DOWN HERMOSA CREEK FROM HERMOSA PARK BRIDGE.

Hermosa Park, 1.4 miles south of; sandstone bowlder 2.5 by 2.5 feet, 30 feet east of trail at top of high bluff over Hermosa Creek; mark, a chiseled square	8,802.07
Hermosa Park, 2.4 miles south of; limestone bowlder 12 by 6 feet and 3 feet above ground, 10 feet west of trail, 150 feet south of foot of steep hill, 6 feet east of creek, 8 feet above water, and 18 feet west of 4-inch blazed spruce; mark, a chiseled square	8,586.04
Hermosa Park, 4.6 miles south of; sandstone bowlder 2 by 2 feet and 1 foot above ground, at lower end of a long park where stream bends from south to west and then south again, 60 feet northeast of limestone ledge, 26 feet north of creek at nearest point, and 50 feet northwest of ford; mark, a chiseled square	8,380.24
Hermosa Park, 5.2 miles south of; limestone bowlder 10 by 8 feet and 6 feet above ground, 10 feet west of creek and 80 feet east of trail, which is here very rough and winding, 600 feet south of a small park; mark, a chiseled square	8,324.38
Hermosa Park, 6.4 miles south of; round red sandstone bowlder 3 feet in diameter, 50 feet east of creek, 10 feet west of trail, 45 feet south of 12-inch spruce, 50 feet northeast by north of 16-inch fir, and 80 feet west of 20-inch dead fir near knoll in park; copper bolt marked "DUR 8219".	8,219.486
Hermosa Park, 7.1 miles south of; diamond-shaped sandstone ledge 3 by 3 feet and 10 inches above ground at north end of small park in timber, 14 feet east of trail on west side of creek, 34 feet east of 18-inch spruce, and 20 feet southwest by south of 8-inch spruce, just below small canyon on east and larger canyon on west side of creek; mark, a chiseled square.	8,138.11
Hermosa Park, 8.5 miles south of, and 2 miles above mouth of south fork of Hermosa Creek; sandstone bowlder, 2 by 2 feet and 6 inches above ground, 10 feet west of trail, 70 feet south of where trail reaches foot of long, steep hill, 10 feet northeast of 3-inch cottonwood tree, 50 feet east of creek and in center of small opening in timber; mark, a chiseled square	7,915.03
Hermosa Park, 10.5 miles south of, at mouth of south fork of Hermosa Creek; sandstone bowlder, 2 by 4 feet and 3 feet above ground, near east wall of canyon, 150 feet east of cook cabin at tie camp, 250 feet east of stream forks, 25 feet west by north of 8-inch pine and 30 feet southeast of 15-inch spruce east of trail; copper bolt marked "DUR 7700"	7,699.914
Hermosa Creek, bed of stream at mouth of south fork	7,690

WYOMING.

SHERIDAN, BIGHORN, AND JOHNSON COUNTIES.

DAYTON, CLOUD PEAK, HYATTVILLE, AND FORT M'KINNEY QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the center of the front of the city hall building at Sheridan and stamped "3738." The height of this bench mark is derived from a

bench mark of the Burlington and Missouri River Railway on their bridge at Sheridan. The height of this bench mark, 3,736 feet, has been corrected by subtracting 12 feet on account of the difference by check between the Burlington and Missouri River Railway and the Northern Pacific Railway at their junction at Huntley, Montana. Dependent upon these, the elevation of the Sheridan datum is accepted as 3,737.560 feet above mean sea level, and the bench marks dependent upon this are stamped, in addition to their elevation, with the letters "SHER."

The leveling was done under the general direction of Mr. E. M. Douglas, geographer, by Mr. E. W. Glafcke, levelman. That portion of the line between Sheridan and Bighorn, being unclosed, is unchecked.

SHERIDAN TO BIGHORN.

	Feet.
Sheridan, in front of City Hall; bronze tablet marked "SHER 3738"	3,737.560
Sheridan, Burlington and Missouri River Railroad station, 1,000 feet south of; bronze tablet in meridian station marked "SHER 3724"	3,724.453
Sheridan, Burlington and Missouri River Railroad bridge No. 388; nail in cap at north end of bridge	3,724
Bighorn, 3½ miles north of; forks of road to Buffalo and to Bighorn, ground at	3,962

BIGHORN TO BUFFALO.

Bighorn, 1.8 miles south of; nail on corner post of wire fence north of cemetery on Buffalo road	4,107,90
Cruse Creek, bed of	4,094
Bighorn, 3.6 miles south of; on rock, mound of rock alongside, ¼ mile north of road, 150 feet from saddle in divide between Cruse and McCormick creeks	4,165.5
Bighorn, 4.7 miles southeast of; McCormick Creek, at junction of Bighorn and Sheridan-Buffalo road, 600 feet north of ranch house; iron post marked "SHER 4086"	4,085.946
Bighorn, 8½ miles southeast of; ¼ mile north of Payne's ranch, in field, by corner post at junction with upper road to Bighorn; iron post marked "SHER 4388"	4,387.948
Divide between Mead Creek and Prairie Dog Creek	4,555
Bighorn, 10½ miles southeast of; on pine post on east side of road, 400 feet west of Hollingsworth's house and 600 feet north of Pompey Creek.	4,572.4
Old Terrill ranch, Prairie Dog Creek, ground at	4,555
Bighorn, 11½ miles southeast of; on nail head in post, 5 feet south of Banner post-office building	4,534.59
Banner, 0.6 mile south of; ¼ mile south of Joe Harper's ranch, at junction of Upper Piney Tunnel road with Sheridan and Buffalo road; iron post marked "SHER 4605"	4,604.857
Banner, 1.8 miles south of; by gate post at James Kirkpatrick's ranch, under wire fence, 200 feet east of barn, 200 feet southeast of house; iron post marked "SHER 4503"	4,502.937
Banner, 4 miles south of; Massacre Hill, divide between Piney and Prairie Dog creeks, on Sheridan and Buffalo road; iron post marked "SHER 4960"	4,959.865
Banner, 6.4 miles south of; Foster's ranch on Piney Creek, 25 feet east of house and near wire fence; iron post marked "SHER 4662"	4,661.767

	Feet.
Divide between Piney and Shell creeks	4,730
Banner, 10 miles south of; 200 feet north of middle fork of Shell Creek and 50 feet west of road, by gatepost in front of house; iron post marked "SHER 4644"	4,643.848
Buffalo, 9.8 miles north of; 1 mile northwest of John Barkey's ranch, near Lake De Smet, and 30 feet east of road, by board gate; iron post marked "SHER 4777"	4,776.833
Buffalo, 7 miles north of; summit between Lake De Smet and Rock Creek, 200 feet east of Sheridan and Buffalo road, on knoll; iron post marked "SHER 4940"	4,939.857
Buffalo, 4¼ miles north of; ¼ mile from Charles Round's ranch, at northeast corner of wire fence, at junction of Rock Creek road with Sheridan and Buffalo road; iron post marked "SHER 4688"	4,687.890

BIG HORN IN A SOUTHWESTERLY DIRECTION TO HYATTVILLE; DOME LAKE AND HYATTVILLE PUBLIC ROAD.

Bighorn; bronze tablet set in foundation cap of college building marked "SHER 4108"	4,107.867
Bighorn, 7.6 miles southwest of; in large limestone bowlder 4 feet high on north face, 20 feet west of road, 1,000 feet northeast of Big Springs, at foot of grade, and 300 feet east of creek; copper bolt marked "SHER 5749"	5,749.485
Bighorn, 12¼ miles southwest of; in limestone rock, size 30 by 50 by 40 feet, 50 feet south of road; copper bolt marked "SHER 7423"	7,423.810
Morrow stage station, 1.7 miles east of; in top of large granite rock, 12 feet high, near northwest face, 150 feet southeast of wagon bridge on Rapid Creek; copper bolt marked "SHER 7443"	7,443.933
Morrow stage station, large granite bowlder 20 feet west of road, 30 feet east of pole fence, and 500 feet southwest of Morrow's cabins on Big Goose Creek	7,596.63
Morrow stage station, 2 miles west of; in granite bowlder 2½ feet high, 5 feet long, 4 feet wide, 100 feet northwest of road, 50 feet east of timber in first large open park west of Big Goose Creek; copper bolt marked "SHER 7847"	7,848.108
Morrow stage station, 4 miles west of; copper nail in stump of 6-inch pine tree, 20 feet east of junction of Shell Creek and Dome Lake roads	8,280.17
Dome Lake, in 4 by 6 foot granite bowlder, 54 feet north of northeast corner of clubhouse; bronze tablet marked "SHER 8821"	8,821.519
Morrow stage station, 5 miles west of; in large morainal bowlder, 5 feet southwest of road, 300 feet above and west of bridge across branch of Goose Creek; copper bolt marked "SHER 7998"	7,998.677
Morrow stage station, 7.1 miles west of; ground on bank of west fork of Goose Creek, 10 feet west of creek, pile of rock alongside	8,491
Morrow stage station, 10 miles west of; in granite bowlder, 4 by 6 feet, 1 foot high, on top of divide between Big Goose and Tongue rivers, 300 feet north of road; copper bolt marked "SHER 9346"	9,347.420
Morrow stage station, 12.4 miles west of; on granite bowlder in park ¼ mile south of bridge over Tongue River, 40 feet east of road, 150 feet west of Tongue River	9,270.65
Morrow stage station, 13.6 miles west of; on summit of Bighorn Mountains, in granite bowlder, 6 by 6 feet, 2 feet above ground, 10 feet southeast of road; copper bolt marked "SHER 9601"	9,601.887
Hyattville, 30 miles northeast of; in 12 by 4 foot granite bowlder of irregular shape, 100 feet east of road, 3 miles southwest of summit, 40 feet north of fork of Willett Creek; copper bolt marked "SHER 9213"	9,214.312

	Feet.
Divide between Willett Creek and Shell Creek	8,875
Shell Creek, crossing of	8,340
Hyattville, 24 miles northeast of; 1½ miles west of Shell Creek, in granite bowlder at the north end of first flat or park above or south of Shell Creek, 30 feet due west of road; copper bolt marked "SHER 8855"	8,855.719
Hyattville, 16½ miles northeast of; 50 feet southeast of "Trapper Corner," 30 feet east of road, in limestone rock, large mound of rocks around it; copper bolt marked "SHER 8594"	8,594.212
Hyattville, 14½ miles northeast of; at forks of road leading to Spring and Hyattville, Wyoming, corral 300 feet to north, springs 250 yards southeast; iron post marked "SHER 7594"	7,593.821
Hyattville, 12 miles north of; on top of "rim rock," mound of rocks around; iron post marked "SHER 6546"	6,546.002
Hyattville, 7½ miles north of; at forks of road to Hyattville via Alkali and via Medicine Lodge Creek, 4 miles north of Medicine Lodge; iron post marked "SHER 5590"	5,590.303
Hyattville, 5½ miles north of; in yard 200 feet northwest of ranch building belonging to Mr. B. F. Wickwire, 400 feet northwest of Medicine Lodge Creek, on east slope of hill near pole fence; iron post marked "SHER 4800"	4,800.035
Hyattville, 2½ miles north of; 140 feet due south of Mr. Allen's ranch house and 20 feet north of road; iron post marked "SHER 4607"	4,607.365
Hyattville, northeast corner Medicine Lodge and Main street; iron post marked "SHER 4447"	4,446.949

HYATTVILLE IN A SOUTHEASTERLY DIRECTION TO TEN SLEEP.

Hyattville, 3½ miles southeast of; at west point of gypsum ridge, 50 feet east of Buffalo and Hyattville stage road; iron post marked "SHER 4667"	4,667.021
Hyattville, 6½ miles southeast of; 50 feet southwest of stage road, 100 feet northwest of Buffalo or Alkali Creek, farm fence belonging to J. J. Smith 150 feet to south; iron post marked "SHER 4492"	4,491.997
Hyattville, 7 miles southeast of; 40 feet southeast of road, 3 miles southeast of Buffalo Creek, in Bad Lands; iron post marked "SHER 4406"	4,406.061
Hyattville, 12½ miles southeast of; in front yard of ranch owned by Mr. Williams, on Brokenback Creek, 150 feet northwest of center of sec. 1[E], T. 48 N., R. 89 W., and 100 feet east of Buffalo and Hyattville stage road; iron post marked "SHER 4522"	4,521.994
Ten Sleep, 3 miles northwest of; on divide between Ten Sleep and Brokenback Creek, 30 feet west of road; iron post marked "SHER 5026"	5,026.020
Ten Sleep, 25 feet north of Buffalo stage road, 300 yards south of Ten Sleep Creek, 100 feet directly south of ranch building owned by Mr. Sutherland; iron post marked "SHER 4513"	4,513.071

TEN SLEEP IN A NORTHEASTERLY DIRECTION TO BUFFALO.

Ten Sleep, 2.6 miles southeast of; top of divide between Ten Sleep and Canyon creeks, 20 feet southwest of road; iron post marked "SHER 5097"	5,097.275
Ten Sleep, 5¼ miles southeast of; in saddle overlooking valley of Canyon Creek ½ mile to north, and ½ mile south of Hunsinger ranch house, 500 feet south of fence corner, ½ mile south of Canyon Creek, 15 feet east of stage road; iron post marked "SHER 5025"	5,024.959

	Feet.
Ten Sleep, 10 miles southeast of; 10 feet south of road in first basin near where road follows south side of south fork of Canyon Creek; iron post marked "SHER 5749"	5,749.028
Ten Sleep, 13.6 miles southeast of; in granite bowlder in top of first bench on west slope of Big Horn Mountains, at the forks of the Buffalo and Red Bank roads; bronze tablet marked "SHER 7290"	7,290.271
Ten Sleep, 17 miles southeast of; at Monument Springs, in limestone rock 15 feet south of Buffalo and Ten Sleep stage road; bronze tablet marked "SHER 7883"	7,882.942
Buffalo, 36 miles southwest of; on divide between Canyon Creek and Powder River, ¼ mile west of Powder River, in quartzite ledge 15 feet northwest of road; bronze tablet marked "SHER 8337"	8,337.022
Buffalo, 32 miles southwest of; summit of Big Horn Mountain peaks called "Three Sisters," 2 miles due north, 3 miles east of north fork of Powder River, in granite bowlder 15 feet north of the Buffalo stage road; copper bolt marked "SHER 8381"	8,380.832
Buffalo, 30 miles southwest of; on divide between south fork and middle fork of Crazy Woman Creek, 1½ miles west of Cloud Peak ranch house, in granite ledge 25 feet north of road; copper bolt marked "SHER 8180"	8,180.467
Buffalo, 27½ miles southwest of; middle fork of Crazy Woman Creek, ¼ mile west of Cloud Peak road ranch, in granite bowlder 150 feet south of road on side hill; copper bolt marked "SHER 8111"	8,111.423
Buffalo, 24½ miles southwest of; on divide between Muddy Creek and north fork of Crazy Woman Creek, in granite bowlder 150 feet south of road in patch of timber; copper bolt marked "SHER 8125"	8,125.109
Buffalo, 21 miles southwest of; ¼ mile south of Muddy Creek, in saddle of divide between Muddy Creek and Billey Creek, on edge of mountains going down grade to valley, in limestone rock 15 feet south of stage road; bronze tablet marked "SHER 7866"	7,866.195
Buffalo, 17½ miles southwest of; foot of grade 300 feet east of mouth of canyon where road enters and ascends to top of mountains, Muddy Creek 1½ miles north, in limestone bowlder; copper bolt marked "SHER 5975	5,974.959
Buffalo, 14 miles southwest of; 200 feet south of Muddy Creek, 100 yards from George Washbaugh's ranch house, in morainal bowlder 30 feet north of road; copper bolt marked "SHER 5142"	5,142.101
Buffalo, 12.7 miles southwest of; 100 feet northeast of Crazy Woman, on Crazy Woman Creek, 500 feet west of Burnett's ranch house, in granite bowlder beside fence post where road enters lane; copper bolt marked "SHER 5019"	5,018.497
Buffalo, 8 miles southwest of; divide between Crazy Woman and Clear Creek drainage, 50 feet west of road in saddle of divide; iron post marked "SHER 5298"	5,297.690
Buffalo, 4½ miles southwest of; inside of fence 300 feet due west of "Cross H." ranch house, 10 feet east of road; iron post marked "SHER 4893"	4,893.103
Buffalo, 2 miles south of; divide between Clear Creek and Nigger Creek, 30 feet north of irrigation ditch owned by Wyoming Land and Cattle Company at "Cross H." ranch; iron post marked "SHER 4836"	4,836.211
Buffalo; in yard of county court-house of Johnson County, 40 feet east of court-house; iron post marked "SHER 4635"	4,635.033
Buffalo, 2 miles north of; divide between Buffalo and Rock creeks, 25 feet west of road; iron post marked "SHER 4797"	4,796.897

CENTRAL MONTANA.

DEERLODGE, LEWIS AND CLARKE, AND JEFFERSON COUNTIES.

BOULDER QUADRANGLE AND HELENA SPECIAL DISTRICT.

The elevations in the following list are based on a bronze tablet set in the foundation of the county court-house at Butte and marked "5767." As explained on page 362 of the Eighteenth Annual Report, Part I, the elevation of this bench mark has been accepted as 5,767.451 feet above mean sea level.

The leveling was executed under the direction of Mr. W. J. Loyd, topographer, by Mr. F. B. Whitlock, levelman.

All permanent bench marks set during the last season and dependent on this datum were stamped with the word "BUTTE" in addition to their figures of elevation.

BOULDER TO EAST HELENA, VIA NORTHERN PACIFIC RAILROAD, HELENA AND BOULDER VALLEY BRANCH.

	Feet.
Bridge 50, bolt in north end of	4,975.52
Bridge 41, nail in center of	5,209.96
Boulder, 4 miles north of; iron post 1 foot out of ground, southeast corner of Amazon Smelter; marked "BUTTE 5097"	5,096.975
Boulder, 7 miles north of; nail in telephone pole 50 feet right of road crossing	5,486.45
Tunnel, mouth of	5,669
Tunnel, road crossing north of	5,657
Top of divide between Boulder and Jefferson; iron post 20 feet right of road over tunnel, marked "BUTTE 5727"	5,727.014
Jefferson, ground at electric power house	4,600
Jefferson, spike in bridge No. 1	4,543.35
Jefferson, bronze tablet in the southwest corner of post-office building at, 18 inches above sidewalk, marked "BUTTE 4554"	4,553.992
Hartwell Station, nail in north end of bridge 17	4,381.12
Hartwell Station, road crossing	4,370
Hartwell, ¼ mile north of; wagon bridge over Montana Central Railroad track	4,345
Hartwell Station, 1 mile north of; road crossing	4,328
Alhambra Station, track at	4,266.8
Alhambra Station, nail in head block 300 feet north of	4,263.16
Clancy, nail in telephone pole	4,223.08
Clancy, iron post at the northeast corner of H. M. Hill's garden fence, marked "BUTTE 4247"	4,247.064
Hartford Depot, nail in north end of platform	4,192.04
Rhorbaugh Station	4,116.7
Rhorbaugh, 2 miles north of; road crossing	4,105
Montana City, ground at section house	4,050
Montana City, head block at road crossing	4,052.19
Montana City, iron post 60 feet in rear of Montana Central section house, marked "BUTTE 4064"	4,064.071

VIA MONTANA CENTRAL RAILROAD.

Montana City, 3 miles north of; road crossing	3,957
East Helena smelter; nail in head block in track opposite	3,926.7
East Helena, 1 mile west of; road crossing	3,919

VIA MAIN LINE NORTHERN PACIFIC RAILROAD TRACK.

	Feet.
Helena, 2.2 miles east of; bronze tablet in the northeast corner of old saloon, "Halfway house" between Helena and East Helena, marked "BUTTE 3934"	3,934.203
Helena, 1.9 miles east of; spike in head block near powder house	3,914.36
Helena, Northern Pacific depot; spike in trolley pole	3,943.60

HELENA TO RIMINI VIA HELENA AND RED MOUNTAIN BRANCH OF NORTHERN PACIFIC RAILROAD.

Montana Central Railroad crossing; nail in head block near	3,919.22
Steadman's iron foundry; nail in trolley pole at electric-road crossing	3,924.58
Broadwater Natatorium, 3¼ miles west of Helena; iron post at northwest corner of, marked "BUTTE 3962"	3,961.519
Broadwater, 2 miles southwest of; nail in south end of bridge No. 4	4,068.76
Broadwater, 3 miles southwest of; southwest corner of section house	4,158.04
Nelson Gulch, mouth of	4,164
Rimini, 9 miles northeast of; 20 feet left of road to Rimini and 150 feet west of road crossing about 6 miles west of Helena; iron post marked "BUTTE 4217"	4,216.533
Bridge No. 6; spike in north end of	4,282.65
Rimini, 7 miles northeast of; nail in head block at Rock Spur	4,391.38
Rimini, 6 miles north of; nail in water tank at Gold Bar, at mouth of canyon	4,517.15
County road crossing	4,537
Rimini, 3½ miles north of; nail in head block at Bear Gulch	4,718.21
Rimini, 2½ miles north of; southwest corner of section house at Moose Creek	4,840
Rimini; spike in head block of spur running to station	5,187.37
Rimini; platform of station at	5,192
Rimini; iron post 30 feet from north end of railroad station, marked "BUTTE 5190"	5,189.528

RIMINI TO BASIN ON PUBLIC ROAD VIA PAUPER'S DREAM AND BUCKEYE MINES.

Rimini, 3 miles south of; on stone on right side of road at Travers's placer diggings	6,106.65
Rimini, 3.3 miles south of; nail in plug northwest corner of Travers's cook house	6,147.07
Rimini, 3.7 miles south of; iron post at the forks of the roads leading to the Pauper's Dream and Ontario mines, marked "BUTTE 6218"	6,217.569
Rimini, 6 miles south of; nail in root of pine at fork of roads to Pauper's Dream and Josephine mines, 500 feet south of cabins	7,311.63
Rimini, 6½ miles south of; iron post on the divide opposite the Pauper's Dream mine, 6 feet from the road and 150 feet from the Pauper's Dream mine, marked "BUTTE 7615"	7,614.590
Rimini, 7 miles south of; ground opposite Merrill mill	7,368
Rimini, 9½ miles southwest of; iron post at the northeast corner of the office at the Buckeye mine, marked "BUTTE 7133"	7,132.601
Basin, 8 miles northwest of; iron post in garden, 30 feet in front of H. Winter's house, marked "BUTTE 6639"	6,638.577
Basin, 6.8 miles northwest of; iron post 30 feet north of bridge over Jacks Creek, left side of road from Basin to H. Winter's camp, 3 miles south of Winter's camp, marked "BUTTE 6273"	6,272.613
Basin, 5.8 miles northwest of; brown tablet in granite bowlder 40 by 20 feet, 300 feet south of Penn Placer, right side of road, marked "BUTTE 6188"	6,187.662

BASIN TO WICKES VIA CATARACT CREEK.

	Feet.
Cataract Creek; second crossing north of Boulder road	5,785
Basin, 3 miles north of; nail in truss bridge crossing Cataract Creek near the Saturday Night mine	5,903.67
Basin, 6½ miles north of; nail in post of ore bin at Copper Bell mine	6,470.24
Basin, 7 miles northeast of; brown tablet in foundation on the east side of the Eva May mill, marked "BUTTE 6545"	6,544.792
Wickes, 5 miles west of; iron post on top of divide between Wickes and Eva May mine, marked "BUTTE 7215"	7,214.802
Wickes, south end of Northern Pacific Railroad station; iron post marked "BUTTE 5162"	5,162.079
Corbin, 3 miles north of Wickes; southeast corner of William Johnson's saloon and opposite the Corbin Hotel; iron post marked "BUTTE 4766"	4,766.078

WICKES TO CLANCY, VIA GREGORY AND CLANCY CREEK PUBLIC ROAD.

Wickes, Montana Central Railroad station; spike in telegraph pole	5,268.06
Wickes, 1 mile north of, opposite saloon	5,254
Gregory, 3 miles north of Wickes; iron post at southeast corner of the schoolhouse marked "BUTTE 5450"	5,449.922
Gregory, 2 miles north of; bronze tablet in granite bowlder 4 feet square, 500 feet north of Clark's ranch and 200 feet north of road leading up Quartz Gulch, 10 feet left of road to Clancy, marked "BUTTE 5048"	5,047.962
Clancy, 5 miles southwest of; southeast corner of the Lehman's ranch house; iron post marked "BUTTE 4677"	4,677.057
Clancy, about 2 miles southwest of; 40 feet from gate leading to Strobel's ranch, bronze tablet in granite bowlder 8 by 4 feet, marked "BUTTE 4408"	4,408.118

FROM THE PAUPER'S DREAM MINE, ON THE CONTINENTAL DIVIDE, SOUTHWEST OF RIMINI, IN A WESTERLY DIRECTION, TO THE ONTARIO MINE AND THENCE TO THE MONARCH MINE, VIA PUBLIC ROAD.

Divide, ground at	7,505
Josephine mine; ground at	7,453
Ontario mine, 10 feet southwest of the superintendent's house at; iron post marked "BUTTE 7032"	7,031.540
Ontario, top of mill	7,050
Bridge over small stream ¼ mile east of old mine	6,570
Republic Mill site, bed of creek	6,292
Old Republic Mill site, 1½ miles west of Ontario mine and 2 miles east of Monarch mine, 150 feet east of bridge crossing Little Blackfoot River; iron post marked "BUTTE 6308"	6,307.655
Monarch mine, ground at	7,212
Monarch mine, northwest corner of cook house; iron post marked "BUTTE 7243"	7,242.032

FROM OLD REPUBLIC MILL SITE DOWN LITTLE BLACKFOOT RIVER TO FORKS OF ROAD ABOUT 5 MILES SOUTHEAST OF ELLISTON.

Miner's Cabin, ¼ mile from Republic Mill	6,229
Old Hidden Treasure Mill, bridge No. 1	5,658
Bridge No. 2	5,642
Elliston, 11 miles south of; 1,400 feet west of Old Hidden Treasure Mill, 350 feet west of bridge over creek, 10 feet left of road to Elliston; iron post marked "BUTTE 5612"	5,611.619
Creek crossing at the forks	5,562
Road, at head of flume	5,518

	Feet.
Hat Creek	5,456
Elliston, 5 miles southeast of; ¼ mile from fork of road leading up Little Blackfoot, 20 feet from road leading from Elliston to Ontario mine, 60 feet in front of Felix Senecal's ranch house; iron post marked "BUTTE 5283"	5,282.702

PUBLIC ROAD UP EAST FORK BLACKFOOT RIVER FROM ELLISTON TO ONTARIO MINE.

Elliston Fluming Company; store headquarters	5,315
Blacksmith cabin, 3 miles southeast of fork of road; nail in sill of	5,715.76
Telegraph mine, cross on big granite rock at the fork of road to	6,240.20
Champion mine, the fork of road to	6,570
Lilly mine, ground at	6,809

FROM NORTHERN PACIFIC RAILROAD STATION, HELENA, NORTH ALONG MONTANA AVENUE 7 MILES, THENCE EAST 4 MILES, THENCE SOUTH 4 MILES TO H. L. CRAM'S RANCH, WHICH IS 4½ MILES NORTHEAST OF NORTHERN PACIFIC STATION.

Helena, 1¼ miles north of; ground at school house	3,910
Helena, 2 miles north of; bronze tablet in wall south side of entrance to the Orphan's Home, marked "BUTTE 3843"	3,842.760
Helena, 3¼ miles north of; northeast corner of granite bowlder 2 by 3 feet, 3 feet from northwest corner of Monroe fence, 200 feet south of Ten-Mile Creek	3,760.28
Ten-Mile Creek bed of	3,756
Helena, 4¼ miles north of; nail in trolley pole at electric-car line and road crossing	3,733.85
Helena, 4¾ miles north of; bronze tablet in southwest corner of the University Building, marked "BUTTE 3724"	3,724.041
Helena, 6 miles north of; nail in fence post opposite Pugh ranch house	3,706.48
T. 11 N., R. 3 W., stone monument corner secs. 19, 20, 29, 30	3,722.63

Running easterly.

Helena, 7 miles north of; nail in fence at corner sec. 21, T. 11 N., R. 3 W	3,689.03
Gamer's ranch; ground opposite house	3,673
Gamer triangulation station, copper bolt	3,662.31
Helena, 9 miles northeast of; ¼ mile north of Gamer triangulation station; iron post 50 feet in front of G. Reed's ranch house, marked "BUTTE 3666"	3,665.966
Helena, 10 miles northeast of; corner G. W. Pugh's ranch; iron post northwest ¼ sec. 23, T. 11 N., R. 3 W., marked "BUTTE 3658"	3,657.950

Running south.

Prickly Pear Creek; water level	3,643
Helena, 7¼ miles northeast of; iron post in front of D. Beach's ranch house, marked "3660"	3,659.910
Helena, 5 miles northeast of; iron post, south side of gate leading to H. L. Cram's ranch, marked "BUTTE 3715"	3,714.889

NORTHERN PACIFIC RAILROAD STATION TO H. L. CRAM'S RANCH.

Helena, 2¼ miles, northeast of; near Wallace Breck's ranch, Prickly Pear Valley; iron post at the intersection of Boulevard and Stubbs Ferry roads, marked "BUTTE 3738"	3,738.228
Helena, Northern Pacific station, 4 miles northeast of; bronze tablet in southwest corner Valley schoolhouse, marked "BUTTE 3738"	3,738.014

FROM BENCH MARK AT G. W. PUGH'S RANCH IN NW. ¼ SEC. 23, T. 11 N., R. 3 W., EASTWARD 2½ MILES, THENCE SOUTH 10½ MILES TO EAST HELENA.

	Feet.
Prickly Pear Creek, bridge at mouth of canyon	3,632.6
Prickly Pear Creek, water level	3,633
East Helena, 8 miles north of; 1 mile north of Geary ranch; iron post, 30 feet east of bridge over Prickly Pear Creek at mouth of canyon, marked "BUTTE 3634"	3,633.906
East Helena, 6 miles north of; iron post at southeast corner Harmony schoolhouse, marked "BUTTE 3722"	3,721.875
East Helena, 2½ miles northeast of; iron post on Canyon Ferry road at Gratten's ranch, marked "BUTTE 3784"	3,783.710
East Helena, 2 miles east of; iron post 100 feet in front of Joseph Kenck's ranch house, marked "BUTTE 3858"	3,857.802
East Helena; bronze tablet in the southeast corner of schoolhouse, marked "BUTTE 3886"	3,885.759
East Helena, 1½ miles south of; bronze tablet in the southwest corner of barn at the Childs ranch, marked "BUTTE 3956"	3,955.808
Prickly Pear Junction, top of rail	3,887.2
Smelter, office building (ground)	3,902
East Helena, 1 mile west of; east end of base line; bronze tablet let in stone 9 inches square, marked "BUTTE 3921"	3,921.186

NORTHERN PACIFIC RAILROAD STATION TO COURT-HOUSE AND CITY HALL, HELENA, THENCE TO UNIONVILLE VIA GRIZZLY GULCH, THENCE EAST TO MONTANA CITY.

Helena, Northern Pacific Railroad station, ¼ mile west of; west end of base line; bronze tablet set in stone 9 inches square, marked "BUTTE 3957.5"	3,957.604
Helena, bronze tablet in wall right side of west entrance to Armory Hall, marked "BUTTE 4013"	4,013.027
Intersection Eleventh avenue and Warren	4,077
Intersection Fifth avenue and Warren	4,129
Northern Pacific Railroad, bench mark on granite sill of the Brown Block (Northern Pacific elevation 4121.6)	4,132.66
Assay Building, corner on east side of bottom step	4,141.31
Helena, court-house; bronze tablet on left side of north entrance, 2 feet above the ground, marked "BUTTE 4157"	4,157.078
Intersection of State and South Ewing streets	4,162
Intersection of State and Main streets	4,105
Helena, city hall; bronze tablet on left side of engine-house door, marked "BUTTE 4108"	4,108.063
Helena, 1 mile south of, 300 feet north of Henry's mill; iron post at forks of roads to Unionville, Helena, and Nelson Gulch, marked "BUTTE 4916"	4,916.049
Hale's mill, top of	4,945
Helena, 6 miles south of; summit of divide between Unionville and Park City; iron post marked "BUTTE 5053"	5,052.944
Unionville, northeast corner of Constance's garden fence; iron post marked "BUTTE 4911"	4,910.903
Divide between Oro Fino and Dry gulches	4,979
Unionville, 1½ miles east of; iron post 50 feet from northwest corner of Hale's reservoir at the head of Dry Gulch, 10 feet left of road leading to Unionville, marked "BUTTE 4946"	4,945.937
Unionville, 1¾ miles east of; bronze tablet in 3 by 3 feet granite rock 50 feet left of road on divide between Tucker Gulch and Dry Creek, marked "BUTTE 5119"	5,118.829

	Feet
Unionville, 3¼ miles south of; bronze tablet in a granite bowlder 3 by 4 by 2 feet, on top of divide between Tucker Gulch and Indian Creek, marked "BUTTE 5258"	5,257.892
Montana City, 3 miles west of; bronze tablet in 4 by 4 by 6 feet granite bowlder, 60 feet south of reservoir at head of Clarke's Creek, ¼ mile east of Cutter's ranch, at forks of road leading to Clancy and Helena, 30 feet from lone fir tree, marked "BUTTE 4589"	4,588.839

FROM NORTHEAST CORNER SEC. 19, T. 11 N., R. 3 W., WEST TO SILVER CREEK, THENCE SOUTH OVER DIVIDE TO SEVEN-MILE CREEK, THENCE SOUTHEASTERLY TO BROADWATER NATATORIUM.

Helena, 8 miles north of; iron post at the northeast corner of sec. 19, T. 11 N., R. 3 W., on Montana avenue marked "BUTTE 3749"	3,748.953
T. 11 N., R. 3 W., southwest corner section 18	3,794
T. 11 N., R. 4 W., southwest corner section 13; iron post southeast corner of schoolhouse, marked "BUTTE 3854"	3,853.910
Helena, 10 miles northwest of; iron post at side of road to Silver City, 20 feet west of bridge crossing Silver Creek, marked "BUTTE 3998"	3,997.911
Silver Creek, road crossing	4,099
Montana Central Railroad track, crossing	4,015
Helena, 8¼ miles northwest of; iron post on summit of divide between Silver Creek and Seven-Mile Creek, marked "BUTTE 4454"	4,453.911
Helena, 7 miles northwest of; opposite old saloon at Seven-Mile Creek, on the Marysville road, marked "4088"	4,087.764
Fort Harrison; bronze tablet in the Administration Building, marked "BUTTE 4004"	4,003.970

FROM KLEINSMIDT'S RANCH NORTHEASTERLY TO MISSOURI RIVER.

Roads, intersection of	3,979
Divide, top of	4,037
Missouri River, on south bank, just north of mouth of Prickly Pear Creek; iron post marked "BUTTE 3600"	3,600.163
Missouri River, water surface at mouth of Prickly Pear Creek	3,589
Missouri River at El Dorado Bar, north bank of; top of cast-iron cap of Missouri River Commission bench mark No. 21	3,628.921

(The elevation of bench mark No. 21, according to the report of the Missouri River Commission for 1891, is 3,611.071. The correct datum point of this bench mark is possibly about 4 feet lower than the top of cap on which United States Geological Survey reading was taken.)

SOUTHERN TEXAS.

MEDINA, FRIO, FAYETTE, LAVACA, GONZALES, CALDWELL, BASTROP, LEE, WILLIAMSON, TRAVIS, BURNET, LLANO, AND GILLESPIE COUNTIES.

All Texas elevations are based on the bronze tablet marked "661.1" at north side of steps on east entrance to city hall at San Antonio, the assumed elevation of which is 661.112 feet.

The leveling in the Flatonia and Hondo quadrangles was done by Mr. J. A. Hinman under the general direction of Mr. E. M. Douglas, geographer, in charge of the Rocky Mountain section of topography.

A main-control line was run through this area in 1896–97, and the

elevations determined were published in the Eighteenth Annual Report, Part I. In that list, on page 368, the elevation of mile board 975 should be 323.072 feet. All bench marks are stamped "S.A." in addition to the elevation markings.

FLATONIA QUADRANGLE.

SANDY FORK SIDING, GALVESTON, HARRISBURG AND SAN ANTONIO RAILROAD, TO SMITHVILLE VIA JEDDO.

Harwood and Waelder public road.

	Feet.
Sandy Fork siding, about 2 miles northeast of; spike in gatepost	384.51
Harwood, 6 miles west of; middle of road opposite signboard	441
Sandy Fork siding, 2 miles northeast of; spike in back of 16-inch post oak tree 1 foot north of road	397.89
Sandy Fork siding, 3 miles northeast of; spike in front of 20-inch post oak tree 25 feet north of road	427.65
Sandy Fork siding, 3½ miles northeast of; crossing of the Gonzales and Lockhart and the Harwood and Waelder public roads; iron post marked "SA 432"	432.008
Sandy Fork siding, 5 miles northeast of; spike in front of 16-inch post oak tree 10 feet north of road and 15 feet west of forks of road	382.96

Settlement road, via Henry Gunn's residence, connecting the Harwood and Waelder and the Waelder and Bastrop public roads.

Sandy Fork siding, 6 miles northeast of; spike in back of west gatepost, 150 feet north of forks of road	405.71
Sandy Fork siding, 7 miles northeast of; spike in root of post oak tree used as gatepost	403.56
Sandy Fork siding, 7½ miles northeast of; forks of road 300 feet south of Henry Gunn's residence; iron post marked "SA 455"	455.070
Sandy Fork siding, 8¼ miles northeast of; spike in back of south gatepost	478.72
Sandy Fork siding, 9 miles northeast of; spike in north side of 20-inch blackjack tree, in middle of crossing of settlement road and the Lockhart and Waelder public road	467.30
Sandy Fork siding, 10½ miles northeast of; spike in north side of 12-inch blackjack tree 10 feet north of gate on west side of road	459.61
Coperas Creek, bed of	384
Sandy Fork siding, 11½ miles northeast of; spike in 16-inch post oak tree on west side of lane	418
Sandy Fork siding, 11¾ miles northeast of; intersection of the Waelder and Bastrop and settlement roads, 7 miles northwest of Waelder; iron post marked "SA 484"	484.045

County Corners, 1½ miles south of Jeddo, via settlement road to Jeddo.

Jeddo, 1½ miles south of; county corner post west side of road, west corner of Fayette and north corner of Gonzales counties	425
Jeddo, 1½ miles south of; spike in front of 16-inch post oak tree, 15 feet west of Waelder and Bastrop road and 100 feet north of forks of road	425.34
Crossroads, 0.4 mile north of county corner	433
Jeddo, ¼ mile south of; spike in blackjack tree used as gatepost near George Brame's residence	435.97
Intersection of lanes	446
Jeddo, about 400 feet southeast of; intersection of settlement road and La Grange and Lockhart public road; iron post marked "SA 455"	455.034

Jeddo to Smithville, via I. B. Holland's, crossing Austin and Port Lavaca public road 4 miles northwest of Cistern, passing one-fourth mile to west of Bohemian Catholic Church, via Nixon Schoolhouse, thence north three-fourths mile to railroad, and by railroad to Smithville.

	Feet.
Jeddo, ¼ mile northeast of; spike in 12-inch mesquite tree in lane	475.1
Intersection of crossroads, at gate just south of church	450
Forks of road in front of church	448
Jeddo, 2¼ miles northeast of; spike in front of 12-inch post oak tree, 200 feet north of farmhouse and 50 feet north of gate	454.65
Jeddo, 2½ miles northeast of; 175 feet south of I. B. Holland's residence, 6 feet west of road; iron post marked "SA 460"	460.254
(At this point levels run through I. B. Holland's field, joining present settlement road 1¼ miles northeast of Holland's.)	
Peach Creek, bed of; ½ mile east of I. B. Holland's	411
Jeddo, 3¼ miles northeast of; spike in east side of 12-inch post oak tree used as gatepost east side of I. B. Holland's field	435.73
Jeddo, 4¼ miles northeast of; spike in 6-inch post oak tree 10 feet west of road and 50 feet northwest of small drain	437.52
Jeddo, 5¾ miles northeast of; spike in 16-inch post oak tree used as gatepost west side	437.25
Jeddo, 7 miles northeast of; spike in 16-inch post oak tree, 200 feet west of forks of road; right-hand to cistern, 125 feet west of public water tank.	474
Forks of road just north of public tank	476
Jeddo, 8 miles northeast of; spike in front of 20-inch post oak tree in lane 200 feet south of tank	491.45
Jeddo, 8¼ miles northeast of; intersection of settlement road and Austin and Port Lavaca public road, opposite mile board 4 miles northwest of Cistern; iron post marked "CSA 474"	474.080
Bohemian Catholic Church, 4 miles southwest of; forks of road ½ mile northeast of Austin and Port Lavaca road	471
Bohemian Catholic Church, 3 miles southwest of; spike in fence corner post in lane north side of road	467
Bohemian Catholic Church, 2 miles southwest of; spike in front of 16-inch post oak tree west side of lane	498.44

Settlement road.

Bohemian Catholic Church, ¼ mile southwest of; spike in 24-inch post oak tree at right angle in road	467.30
Bohemian Catholic Church, ⅛ mile west of; 40 feet south of intersection of lanes and 5 feet south of leaning post oak tree; iron post marked "SA 472"	471.661
Road corner, ⅛ mile north of iron post	469
Bartons Creek, bed of	405
Bohemian Catholic Church, 1 mile north of; spike in 10-inch post oak tree 10 feet east of road	413.34
Bohemian Catholic Church, 2¼ miles north of; spike in knot in 16-inch post oak tree 6 feet east of road	439.67
Schoolhouse, center of road opposite	476
Bohemian Catholic Church, 3¼ miles north of; spike in 20-inch post oak tree 4 feet north of road	469.12

Lockhart Branch Missouri, Kansas and Texas Railway.

Mile board 974, about 100 yards east of; center of track at road crossing	460
Smithville, 4¼ miles west of; second telegraph pole east of mile board 974, corner of fence 65 feet northeast of road crossing; iron post marked "SA 460"	460.190

	Feet.
Trestle No. 1885, top of tie in center of	449
Road crossing, center of track	456.3
Trestle No. 1884, top of tie in center of	473.8
Mile board 973, spike in telegraph pole	483.86
Road crossing, center of track	471.4
Trestle No. 1883, top of tie in center of	456.7
Road crossing, center of track	450.1
Trestle No. 1882, top of tie in center of	445.7
Mile board 972, about ¼ mile east of; 25 feet northwest of road crossing; iron post marked "SA 433"	433.117
Road crossing near bench mark, center of track	429.8
Mile board 971, spike in telegraph pole	393.67
Trestle No. 1881, top of tie in center of	385.3
Trestle No. 1880, top of tie in center of	356.9
Trestle No. 1879, top of tie in center of	348.8
Mile board 970, spike in front of fifth telegraph pole east of	338.46
Trestle No. 1878, top of tie in center of	324.5

SMITHVILLE TO FLATONIA, VIA STELLAR.

Smithville and Cistern public road.

Smithville, 1 mile south of; spike in fence corner post at mouth of lane, east side of road	328.95
Smithville, 2 miles south of; spike in front of 16-inch post oak tree, 25 feet east of road	372.28
Forks of road and summit of hill	379
Willow Creek, bed of	342
Smithville, 3 miles south of; 400 feet southeast of the intersection of the Flatonia and Smithville and Cistern and Smithville public roads, 10 feet west of the Flatonia road and 60 feet east of the Cistern road; iron post marked "SA 393"	393.125

Smithville and Flatonia public road.

Smithville, 4¼ miles southeast of; spike in front of 18-inch post oak tree south of road	402.91
Smithville, 5¼ miles southeast of; spike in back of 18-inch elm tree 15 feet west of road and 75 feet west of west bank of Bartons Creek	330.41
Bartons Creek, bed of	310
Smithville, 6¼ miles southeast of; angle of wire fence 35 feet east of road, 12 feet west of post oak tree used as fence post; iron post marked "SA 428"	428.018
Smithville, 7¼ miles southeast of; spike in back of 18-inch post oak tree 2 feet west of road	446.70
Smithville, 6¼ miles southeast of; spike in back of 10-inch blackjack tree 6 feet east of road	436.92
Stellar post-office, 75 feet south of; spike in front of 16-inch post oak tree 2 feet west of road	427.97
Smithville, 11 miles southeast of; spike in front of 18-inch post oak tree 3 feet east of road	400.54
Smithville, 12 miles southeast of; spike in back of 16-inch post oak tree 2 feet west of road	356.90
Buckner Creek, bed of	326
Bridge, floor of	346
Buckner Creek, 200 feet north of; intersection of Smithville and Flatonia and La Grange and Lockhart public roads; iron post marked "SA 349".	349.087

	Feet.
Smithville, 13 miles southeast of; spike in front of 12-inch post oak tree, 3 feet east of road, and 50 feet south of where the La Grange and Lockhart public road leaves the Smithville and Flatonia road	357.61
Smithville, 13¾ miles southeast of; spike in 12-inch post oak tree, at intersection of Smithville and Flatonia and Muldoon and Cistern public roads, 300 feet southwest of church	390.62
Smithville, 15½ miles southeast of; spike in 14-inch post oak tree 1 foot from fence, west side of road	353.61
Live Oak Creek, bed of	332
Dogwood Creek, 1,200 feet north of; 125 feet north of branch 15 feet east of road; iron post marked "SA 357"	357.188
Dogwood Creek, bed of	339
Smithville, 17¼ miles southeast of; spike in back of 12-inch post oak tree, 10 feet east of road, 40 feet northwest of intersection of roads, 30 feet from fence corner	408.99
Smithville, 18¾ miles southeast of; spike in front of 12-inch post oak tree, 15 feet west of road, 50 feet northeast of gate	434.83
Flatonia, about 5 miles northwest of; intersection of Smithville and Flatonia and Muldoon and Flatonia public roads, 5½ miles southwest of Muldoon, 1,000 feet north of Pin Oak Creek; iron post marked "SA 377"	377.288
Pin Oak Creek, bed of	366
Flatonia, 2½ miles northwest of; spike in front of telephone pole, east side of road, near west line of right-of-way fence, Waco branch of San Antonio and Aransas Pass Railway	390.31

FLATONIA VIA CISTERN TO PRIMMS SPUR ON MISSOURI, KANSAS AND TEXAS RAILWAY.

Flatonia and Cistern public road, commencing at temporary bench mark, mile board 150, Waco branch of San Antonio and Aransas Pass Railway.

Road crossing of Flatonia and Cistern road and San Antonio and Aransas Pass Railway, center of track	405
Mile board 150, ½ mile northwest of; spike in back of 18-inch post oak tree, west side of road; board on tree marked "Cistern 9 miles"	414.07
Mile board 150, 1½ miles northwest of; spike in front of 12-inch post oak tree 1 foot west of road	424.03
Mile board 150, 2½ miles northwest of; west side of forks of road, 3 feet west of wire fence and 40 feet north of intersection of roads, about 200 feet west of Martin McAnally's residence; iron post marked "SA 425"	424.932
Mile board 150, 3½ miles northwest of; spike in front of 20 inch post oak tree west side of road	421.39
Mile board 150, 4½ miles northwest of; spike in front of 16-inch post oak tree west side of road	434.94
Colony post-office, ½ mile south of; intersection of Flatonia and Cistern and a public road that connects the former with the Flatonia and Waelder public road, about 400 feet north of John Malony's frame house; iron post marked "SA 435"	435.084
Colony post-office, centre of road in front of	432
Flatonia, about 8½ miles northwest of; spike in front of 12-inch post oak tree 5 feet west of road	436.11
Flatonia, 9½ miles northwest of; spike in front of 24-inch post oak tree, 10 miles west of road	389.08
Flatonia, about 10 miles northwest of; spike in front of 16-inch post oak tree east side of road	422.38
Cistern, fence corner opposite post-office; iron post marked "SA 481"	481.007

Cistern and Smithville public road.

	Feet.
Dogwood Creek, bed of	407
Live Oak Creek, bed of	388
Cistern, 1½ miles north of; spike in 24-inch pin oak tree, south bank of Live Oak Creek, 25 feet southeast of bridge	399.80
Cistern, 2½ miles north of; spike in 10-inch post oak tree, tree used as post in angle of fence	446.01
Cistern, 3½ miles north of; spike in root of 24 inch post oak tree	471.62
Cistern, 4½ miles north of; summit of divide between Live Oak and Buckner creeks, west side of lane and 2 feet east of wire fence; iron post marked "SA 481"	481.086
Cistern, 5½ miles north of; spike in 7-inch mesquite tree on east side of road, at angle in fence, wire nailed to tree	414.38
Buckner Creek, bed of	392
Cistern, 7 miles north of; spike in back of 30-inch post oak tree west side of road	414.25
Cistern, 8 miles north of; spike in back of 12-inch post oak tree east side of road	432.79
Cistern, 9 miles north of; spike in front of 12-inch post oak tree east side of road	422.48
Cistern, 9½ miles north of; forks of Cistern and Smithville public road and a settlement road; iron post marked "SA 416"	416.185
Bartons Creek, bed of	356
Cistern, 10½ miles north of; spike in front of 14-inch post oak tree 20 feet east of road	388.28
Prickly Pear Creek, bed of	372
Cistern, 11½ miles north of; spike in 16-inch post oak tree 5 feet west of road	402.82
Cistern, 13 miles north of; spike in front of 14-inch post oak tree west side of road	416.39

Smithville and Flatonia public road.

Smithville, about 3½ miles southeast of; spike in 20-inch leaning post oak tree 20 feet north of the intersection of the old La Grange and Bastrop and Smithville and Flatonia public roads	434.03

Old La Grange and Bastrop public road.

Smithville, 4½ miles southeast of; spike in back of 12-inch dead post oak tree 2 feet south of road	367.89
Smithville, 6 miles southeast of; spike in back of 30-inch post oak tree 6 feet south of road	336.69
Smithville, 7½ miles southeast of; spike in root of 22-inch live oak tree south side of lane	306.17

MILE BOARD NO. 975 ON MISSOURI, KANSAS AND TEXAS RAILWAY, SOUTH TO PERMANENT BENCH MARK NO. 162, ABOUT 2½ MILES SOUTH OF STELLAR POST-OFFICE.

West Point and Smithville public road.

West Point, 3½ miles west of; forks of Smithville and West Point and a public road that branches off from it and goes to Muldoon and Flatonia, intersection of roads, about ½ mile south of mile board 975; iron post marked "SA 322"	321.906

Primm and Muldoon public road.

Cedar Creek, bed of	303
Mile board 975, 1½ miles south of; spike in knot on 18-inch post oak tree 15 feet east of intersection of roads	408.01

	Feet.
Mile board 975, 3 miles south of; spike in 20-inch post oak tree 20 feet east of road	425.79
Mile board 975, 4 miles south of; spike in back of 12-inch post oak tree 8 feet west of road	435.42
Mile board 975, about 5 miles south of; corner of fence at intersection of roads, 25 feet southeast of the La Grange and Lockhart and Smithville and Muldoon public roads, 16 miles southwest of La Grange; iron post marked "SA 404"	403.938
La Grange and Lockhart roads, intersection of	383
Mile board 975, 6½ miles south of; spike in front of 14-inch post oak tree 20 feet west of road, 200 feet east of house	421.88

La Grange and Lockhart public road.

Mile board 975, 5¾ miles south of; spike in 18-inch post oak tree at the intersection of the Smithville and Muldoon and La Grange and Lockhart public roads	383.44
Mile board 975, 7 miles southwest of; spike in back of 12-inch post oak tree 5 feet east of road	389.18
Mile board 975, 8¼ miles southwest of; spike in back of 24-inch post oak tree 30 feet east of road	366.77
Mile board 975, 9¼ miles southwest of; spike in front of 14-inch post oak tree 15 feet east of road, 400 feet northwest of house	372.64

JEDDO, EASTWARD, VIA CISTERN TO PERMANENT BENCH MARK NO. 162, ABOUT 2¼ MILES SOUTH OF STELLAR POST-OFFICE.

La Grange and Lockhart public road.

Jeddo, ¾ mile southeast of; road forks at foot of sand hill	417
Jeddo, about 1 mile southeast of; spike in front of 16-inch hickory tree 100 feet east of E. H. Cockrell's residence	476.06
Jeddo, 2 miles east of; crossroads just west of signboard	444
Jeddo, 2¼ miles east of; spike in front of 14-inch post oak tree 5 feet south of road	465.92
Jeddo, 2¾ miles east of; forks of road leading to southwest, signboard on tree and field on east	452
Jeddo, about 3 miles east of; intersection of La Grange and Lockhart and settlement road leading to southwest, 35 feet south of wire fence; iron post marked "SA 454"	454.206
Jeddo, 4 miles east of; spike in front of 8-inch post oak tree north side of road and just west of bridge over Peach Creek	401.24
Peach Creek, bed of	382
Jeddo, about 5¼ miles east of; spike in front of west gatepost south side of road	413.47
Live Oak Creek, bed of	371
Cistern, about 1¼ miles east of; spike in front of a 20-inch post oak tree used as gatepost	388.27
Cistern, 2 miles east of; spike in front of 20-inch post oak tree 15 feet west of road	417.10
Cistern, 3¼ miles east of; spike in root of 14-inch post oak tree 5 feet south of road	405.73
Cistern, about 4 miles east of; intersection of roads, 10 feet north of gate entrance to east side of Cockrell's pasture and 30 feet south of mouth of lane; iron post marked "SA 422"	421.820
Cistern, 5¼ miles east of; spike in root of 18-inch post oak tree 20 feet south of road on east bank of branch	375.87

WAELDER, NORTHWEST TO PERMANENT BENCH MARK NO. 153, ABOUT 2¼ MILES SOUTH OF JEDDO.

Waelder and Bastrop public road.

	Feet.
Waelder, 1 mile northwest of; spike in root of 16-inch leaning post oak tree 2 feet south of road	418.72
Waelder, 2 miles northwest of; spike in east gatepost north side of lane.	407.72
Waelder, 3 miles northwest of; spike in fence corner post east side of road.	447.41
Waelder, 3¼ miles northwest of; forks of Waelder and Bastrop and Waelder and Lockhart public roads, 700 feet north of two-story house, 10 feet north of gate; iron post marked "SA 475"	474.576
Waelder, 5 miles northwest of; spike in front of 30-inch elm tree 25 feet east of road	394.05
Coperas Creek, bed of	373
Waelder, 6 miles northwest of; spike in front of 18-inch post oak tree in lane	392.30

WAELDER TO CISTERN, VIA ELM GROVE CHURCH.

Flatonia and Waelder public road.

Waelder, 1¼ miles north of; spike in southwest corner post of fence, at the intersection of the Flatonia and Waelder and Waelder and Bastrop public roads	420.20
Waelder, 1¾ miles north of; spike in back of 12-inch post oak tree east side of lane	419.44
Waelder, 2¼ miles north of; spike in front of 16-inch post oak tree 3 feet west of road	427.89
Coperas Creek, bed of	338
Waelder, 4 miles north of; spike in front of 16-inch post oak tree east side of road	410.65
"The double live oak trees," 20 feet south of; intersection of Waelder and Jeddo public roads, southeast corner of wire fence; iron post marked "SA 444"	444.408
"The double live oak trees," 1 mile south of; spike in front of 16-inch post oak tree 1 foot west of road	359.36
Peach Creek, bed of	337
Cistern, about 5 miles southwest of; 150 feet south of Elm Grove Church, 50 feet east of schoolhouse, 25 feet northeast of the intersections of a third-class road; iron post marked "SA 372"	372.235

Third-class road to cistern.

Cistern, 4¼ miles southwest of; spike in front of 12-inch post oak tree 5 feet west of road	384.27
Cistern, about 3¼ miles southwest of; spike in front of 12-inch post oak tree 175 feet southwest of gate	416.63

First-class road.

Cistern, about 2 miles southwest of; spike in back of 16-inch post oak tree.	433.98
Cistern, 1 mile southwest of; spike in east side of 16-inch post oak tree in center of lane	422.45

FLATONIA TO ELM GROVE CHURCH.

Flatonia and Waelder public road.

Flatonia, 1 mile northwest of; spike in front of 14-inch post oak tree west side of road	430.38
Flatonia, about 2 miles northwest of; spike in front of 20-inch post oak tree east side of road	387.10

	Feet.
Fivemile Creek, bed of	341
Flatonia, 3¼ miles northwest of; 80 feet west of wooden bridge over Fivemile Creek, 15 feet south of road; iron post marked "SA 351"	350.961
Westbrook Creek, bed of	332
Flatonia, 4¼ miles northwest of; spike in front of post oak tree 10 feet south of road	361.32
Flatonia, 5¼ miles northwest of; spike in back of 16-inch post oak tree 15 feet north of road	384.02
Elm Grove Church, 3¼ miles southeast of; forks of road, 150 feet south of mouth of lane; iron post marked "SA 360"	360.002
Elm Grove Church, about 2¼ miles southeast of; spike in front of 14-inch post oak tree 15 feet west of road	399.13
Elm Grove Church, about 1¼ miles southeast of; spike in front of 16-inch post oak tree 20 feet west of road	365.81
Elm Grove Church, about ¼ mile southeast of; spike in back of 18-inch post oak tree 3 feet northwest of road	352.24

FLATONIA TO MOULTON VIA WACO BRANCH OF SAN ANTONIO AND ARANSAS PASS RAILWAY.

Trestle No. 77, top of tie	464.6
Trestle No. 76, top of tie	469.4
Trestle No. 74, top of tie	493.2
Trestle No. 73, top of tie	493.2
Mile board 146, spike in back of first telegraph pole south of	484.31
Trestle No. 71, top of tie	481
Trestle No. 70, top of tie	480.3
Road crossing, center of track	496
Mile board 145, spike in back of fourth telegraph pole south of	493.42
Trestle No. 68, top of tie	491.4
Road crossing, center of track	491
Trestle No. 67, top of tie	480.9
Trestle No. 66, top of tie	476.4
Trestle No. 65, top of tie	467.1
Mile board 144, spike in back of telegraph pole	467.55
Road crossing, center of track	479.4
Trestle No. 60, top of tie	456.7
Mile board 143, second telegraph pole south of; crossing of Gonzales and Flatonia public road via Old Moulton, in northwest corner of right-of-way fence, 700 feet east of Lavaca River; iron post marked "SA 448"	447.990
Road crossing, center of track	449.1
Trestle No. 58, top of tie	438.8
Trestle No. 58, bed of branch	417
Trestle No. 57, bed of branch	405.3
Mile board 142, spike in back of telegraph pole	419.30
Trestle No. 55, top of tie	406.4
Mile board 141, spike in back of telegraph pole	412.59
Trestle No. 50, top of tie	394.8
Mile board 140, spike in back of telegraph pole	386.96
Trestle No. 48, top of tie	379.7
Trestle No. 48, bed of branch	362.5
Road crossing, center of track	355.3
Moulton, 600 feet north of passenger station; crossing of the Flatonia and Moulton public road, in northwest corner of right-of-way fence; iron post marked "SA 391"	391.058
Moulton, center of track at Flatonia and Moulton road crossing	389.8
Moulton, center of track in front of passenger station	389.8

MOULTON TO GONZALES, VIA NICKEL.

Moulton and Gonzales public road.

	Feet.
Moulton, 1½ miles southwest of; spike in back of northwest corner fence post at the intersection of the Shiner and Moulton public road	366.79
Moulton, 2 miles southwest of; spike in front of fence corner post, north side of road, 200 feet southeast of house	426.15
Moulton, 3 miles southwest of; spike in root of 20-inch post oak tree in lane	444.87
Lavaca River, west prong; bed of	417
Moulton, about 3½ miles southwest of; intersection of Flatonia and Gonzales road via Old Moulton, about ¼ mile north of White's cotton gin; iron post marked "SA 475"	475.022
Nickel, 1½ miles northeast of; spike in 24-inch dead post oak tree, 3 feet south of road	515.29
Lavaca and Gonzales county line post	483.5
Nickel; center of road in front of post-office	452
Nickel, 600 feet south of post-office; at forks of the Moulton and Gonzales, and Nickel and Dilworth public roads 7 miles north of Dilworth; iron post marked "SA 446"	445.909
Nickel, 1 mile southwest of; spike in 12-inch post oak tree 8 feet north of fence corner post	375.09
Nickel, 2 miles southwest of; spike in front of 14-inch post oak tree 6 feet north of road	374.27
Nickel, 3 miles southwest of; spike in front of 12-inch post oak tree 15 feet south of road	342.54
Nickel, about 3½ miles southwest of; 3 feet north of wire fence, 20 feet south of road, at brow of hill east of Peach Creek, 400 feet southwest of Jeff Hull's residence; iron post marked "SA 359"	358.938
Bushy Creek; bed of	282
Nickel, 4½ miles southwest of; spike in back of 12-inch post oak tree in lane 5 feet north of road	285.57
Brushy Creek, bed of	256
Peach Creek, bed of	250
Nickel, 5½ miles southwest of; 100 feet northwest of Peach Creek in forks of road; right-hand goes to Opossom Trot, near A. A. Poge's cotton gin; iron post marked "SA 269"	268.892
Nickel, 6½ miles southwest of; spike in front of 20-inch post oak tree 5 feet north of road	271.45
Gonzales, 8 miles northeast of; spike in front of 12-inch post oak tree 15 feet north of road	314.44
Denton Creek, bed of	261
Gonzales, 7 miles northeast of; forks of road, ½ mile west of Denton Creek, 14½ miles southwest of Moulton; iron post marked "SA 313"	312.941
Gonzales, 6 miles northeast of; spike in front of 12-inch post oak tree, wire fence nailed to tree, south side of road, 15½ miles southwest of Moulton	337.28
Gonzales, about 4½ miles northeast of; spike in back of 14-inch post oak tree, 25 feet north of fence, 17 miles southwest of Moulton	355.36
Gonzales, 3½ miles northeast of; spike in front of 10-inch post oak tree 5 feet south of road	360.80
Gonzales, 2½ miles northeast of; 50 feet northwest of the crossing of the Lockhart branch of San Antonio and Aransas Pass Railway, and the Moulton and Gonzales public road, 19 miles southwest of Moulton; iron post marked "SA 336"	335.855

LOCKHART BRANCH OF SAN ANTONIO AND ARANSAS PASS RAILWAY.

	Feet.
Trestle No. 63, top of tie	326
Carr's Creek, trestle No. 67, top of tie	287.2
Gonzales, 1¼ miles east of; spike in second telegraph pole west of mile-board 149	305.40
Gonzales, ¾ mile east of; spike in west side of first telegraph pole east of road crossing, Waelder and Gonzales public road via Opossom Trot	303.19
Railroad crossing, center of track; San Antonio and Aransas Pass Railway and Gonzales branch of the Galveston, Harrisburg and San Antonio Railroad	302.4
Gonzales, 75 feet west of the passenger station of the San Antonio and Aransas Pass Railway; 50 feet southwest of the crossing of North avenue, 50 feet south of main track; iron post marked "SA 306"	305.738

GONZALES TO HARWOOD.

Gonzales branch of the Galveston, Harrisburg and San Antonio Railroad.

Trestle No. 42, top of tie	302.5
Trestle No. 40, top of tie	305.2
Road crossing, center of track	314.7
Gonzales, 1¼ miles north of; spike in back of fourth telegraph pole south of mile board 11	314.29
Trestle No. 38, top of tie	320.6
Trestle No. 34, top of tie	345.7
Trestle No. 33, top of tie	359.5
Mile board 10; spike in front of telegraph pole	368.45
Trestle No. 31, top of tie	373.8
Trestle No. 29, top of tie	373.9
Mile board 9; spike in back of telegraph pole	369.02
Section house 206, 1¼ miles south of; 25 feet east of track, 6 feet west of the southwest corner of iron fence inclosing cemetery, halfway between mile boards 8 and 9; iron post marked "SA 393"	392.813
Trestle No. 27, top of tie	388.7
Trestle No. 25, top of tie	381.5
Mile board 7; spike in back of telegraph pole	406.90
Section house 206, center of track in front of	411.7
Trestle No. 23, top of tie	410.6
Trestle No. 22, top of tie	403.3
Trestle No. 20, top of tie	379.7
Mile board 6, spike in first telegraph pole north of	387.22
Kokernot siding, center of track in front of signboard	398.7
Kokernot siding, 12 feet south of north switch stand; 15 feet east of main track, 8¼ telegraph poles north of mile board 6; iron post marked "SA 406"	405.760
Trestle No. 19, top of tie	408.9
Mile board 5, spike in back of telegraph pole	428.22
Nevill Spur, center of track at head block	439.9
Trestle No. 15, top of tie	456.4
Mile board 4, spike in back of telegraph pole	471.70
Trestle No. 12, top of tie	463
Mile board 3, spike in first telegraph pole south of	460.21
Trestle No. 9, top of tie	435.9
Mile board 2, 1¼ telegraph poles south of; corner of fence at road crossing, 50 feet east of head block at wood spur, 150 feet northeast of settlement; iron post marked "SA 441"	440.776

	Feet.
Trestle No. 6, top of tie	446
Trestle No. 4, top of tie	439.6
Mile board 1, spike in side of telegraph pole	441.14
Trestle No. 3, top of tie	439.4
Trestle No. 2, top of tie	447.0

FROM MILE BOARD 137 (5 MILES WEST OF WAELDER) TO GONZALES.

Gonzales and Bastrop public road.

Mile board 137, Galveston, Harrisburg and San Antonio Railway, 1 mile south of; spike in back of 12-inch post oak tree, 12 feet west of road, in lane	379.91
Mile board 137, 1¼ miles south of; intersection of roads, 20 feet east of center of public road, 6 feet south of corner of fence, 100 feet northeast of B. A. Eversole's residence; iron post marked "SA 359.5"	359.515
Sandy Fork, bed of	319
Mile board 137, 2¾ miles south of; intersection of Bastrop and Gonzales and Harwood and Waelder public roads 6 miles west of Waelder and 12 miles north of Gonzales; iron post marked "SA 358"	358.041
Dry Run Branch, bed of	331
Mile board 137, 3¾ miles south of; spike in north gatepost west side of road	380.85
Mile board 137, 4¾ miles south of; spike in front of south gatepost west side of road	433.62
Mile board 137, 6 miles south of; spike in front of south gatepost east side of road	425.58
Mile board 137, 7 miles south of; summit of ridge about ¼ mile south of branch, 2 feet east of west line of wire fence in lane; iron post marked "SA 421"	421.120
Gonzales, 6¾ miles north of; spike in front of 12-inch mesquite tree west side of road, wire fence nailed to tree	423.48
Gonzales, 6 miles north of; at forks of Gonzales and Thompsonville and Gonzales and Sandy Fork roads; iron post marked "SA 419"	419.105
Gonzales, 5 miles north of; spike in front of 10-inch mesquite tree 12 feet north of gate in east line of wire fence	401.61
Gonzales, 3½ miles north of; spike in south side of 6-inch mesquite tree east side of road	365.86
Gonzales, 2¾ miles north of; brow of ridge east side of road, 1½ feet west of wire fence, 10 feet north of gate, 400 feet south of branch; iron post marked "SA 359"	359.168
Gonzales, 1¾ miles north of; spike in north gate post west side of road	333.78
Gonzales, ¼ mile north of; spike in fence corner post southeast corner of cemetery	313.59

GONZALES TO WAELDER.

Gonzales and Waelder public road, via Opossum Trot.

Gonzales courthouse, 5 feet east of north entrance; bronze tablet set in vertical rock over basement window ¼ mile south of permanent bench mark 189, marked "SA 299"	299.011
Gonzales, 1¾ miles northeast of passenger station; spike in front of telephone pole	308.70
Gonzales, 3 miles northeast of; spike in post oak tree used as gate post at entrance to Swift's residence, east side of road	360.38
Carrs Creek, bed of	293

	Feet.
Gonzales, 4 miles northeast of; intersection of roads southeast corner of wire fence at private road ¼ mile northeast of Carrs Creek; iron post marked "SA 338"	338.066
Gonzales, 5 miles northeast of; spike in back of 16-inch post oak tree 3 feet east of road on summit	379.80
Gonzales, 6¼ miles northeast of; spike in back of 14-inch post oak tree in lane	381.16
Denton Creek, bed of	296
Gonzales, 7¼ miles northeast of; spike in front of telephone pole ¼ mile northeast of Denton Creek	309.45
Gonzales, 8 miles northeast of; intersection of roads 125 feet northwest of mouth of lane about ¾ mile northeast of Denton Creek; iron post marked "SA 341"	340.923
Finleys Creek, bed of	299
Opossom Trot, 2¾ miles southwest of; spike in back of telephone pole	349.71
Clear Fork, bed of	319
Opossom Trot, 1¼ miles southwest of; spike in front of 6-inch post oak tree 6 feet east of branch	326.79
Prickley Pear church and schoolhouse, ground at forks of road	371
Opossom Trot, ¼ mile southwest of; spike in front of 20-inch post oak tree 5 feet east of road, about 800 feet northwest of church and schoolhouse	369.31
Opossom Trot; intersection of roads, 150 feet southwest of old abandoned store, 250 feet southeast of cotton gin, 7 miles southwest of Waelder; iron post marked "SA 330"	329.895
Opossom Trot, 1 mile northeast of; spike in front of 18-inch post oak tree 50 feet north of the intersection of the Flatonia and Gonzales roads, via Opossom Trot	336.30
Sandy Fork, bed of	287
Opossom Trot, 2¼ miles northeast of; spike in back of 16-inch post oak tree 3 feet east of road	315.28
Pecan Creek, bed of	301
Waelder, 3¼ miles southwest of; spike in front of 16-inch post oak tree 8 feet west of road	353.64
Waelder, 3 miles southwest of; intersection of roads, west side of main road, about 1 mile northeast of Pecan Creek; iron post marked "SA 373".	372.946
Waelder, 1¾ miles southwest of; spike in front of 10-inch post oak tree 15 feet west of road	395.52
Waelder, ¾ mile southwest of; spike in front of 14-inch post oak tree on summit of ridge	407.95
Boylage Creek, bed of	350

ONE MILE NORTHEAST OF OPOSSOM TROT TO MILE BOARD 123, ON GALVESTON, HARRISBURG AND SAN ANTONIO RAILROAD, 2 MILES WEST OF FLATONIA.

Flatonia and Gonzales public road.

Opossom Trot, about 1¾ miles northeast of; 50 feet west of Sandy Fork and on west bank 2 feet south of fence, on north side of road, 400 feet east of foot of ridge; iron post marked "SA 297"	297.099
Sandy Fork, bed of	285
Opossom Trot, 3¼ miles northeast of; spike in front of 20-inch post oak tree 20 feet north of road	363.84
Opossom Trot, 4¼ miles northeast of; spike in 12-inch leaning post oak tree 3 feet north of road	368.38
Opossom Trot, 4¾ miles northeast of; 150 feet west of branch, 25 feet north of road, 2 feet south of wire fence; iron post marked "SA 348"	348.138

	Feet.
Opossom Trot, 6 miles northeast of; spike in front of 12-inch post oak tree 2 feet south of road	328.82
Opossom Trot, 6¾ miles northeast of; spike in front of 10-inch post oak tree 20 feet north of road	311.88
Opossom Trot, 7 miles northeast of; intersection of Flatonia and Gonzales, via Opossom Trot, and the Moulton and Waelder roads, 8¼ miles north of Moulton, 100 feet southeast of Winkfield's old cotton gin, 75 feet west of the Moulton road; iron post marked "SA 330"	330.038
Opossom Trot, 9 miles northeast of; spike in three-prong pin oak tree 5 feet north of road	301.07
Opossom Trot, 10¼ miles northeast of; intersection of roads 2 feet east of wire fence, 25 feet north of gate that settlement road enters, running in a westerly direction and intersecting the Moulton and Waelder road about 1¼ miles west; iron post marked "SA 330"	330.104
Mile board 123, 4¼ miles southwest of; spike in back of 12-inch post oak tree 1 foot south of road	354.13
Mile board 123, 3¼ miles southwest of; spike in front of 18-inch post oak tree 5 feet south of road	369.73
Mile board 123, 2¼ miles southwest of; spike in front of 18-inch post oak tree 2 feet south of road	384.68
Mile board 123, ¼ mile west of; southeast corner of right of way fence at the crossing of the Flatonia and Gonzales public road at cattle guard No. 296, Galveston, Harrisburg and San Antonio Railway; iron post marked "SA 392"	392.088

FROM BENCH MARK NO. 181, 3¼ MILES SOUTHWEST OF MOULTON, TO PERMANENT BENCH MARK NO. 179, 4 MILES NORTH OF MOULTON, VIA OLD MOULTON.

Flatonia and Gonzales public road in a northeasterly direction.

Permanent bench mark 181, about 1 mile northeast of; spike in root of 20-inch post oak tree in lane	437.02
Old Moulton; intersection of the Waelder and New Moulton pubic road and a road that connects the Waelder and New Moulton road and the Gonzales and Flatonia road, west side of public square, about 2 miles northeast of bench mark No. 181; iron post marked "SA 436"	435.917
Old Moulton, 1 mile northeast of; spike in fence corner post east side of lane	468.86
Old Moulton, 2 miles northeast of; spike in 12-inch leaning post oak tree 50 feet southeast of gate, west side of road	457.18
Old Moulton, 3 miles northeast of; spike in back of 14-inch post oak tree 20 feet west of road	490.63
Lavaca River, bed of	420

OLD MOULTON TO MILE BOARD NO. 130, ON THE GALVESTON, HARRISBURG AND SAN ANTONIO RAILWAY, 2 MILES EAST OF WAELDER.

Waelder and Moulton public road in a northwesterly direction.

Old Moulton, about ¼ mile northwest of; spike in front of 14-inch post oak tree, used as a gatepost, west side of road, 60 feet west of small bridge.	369.51
Sulphur Creek, bed of	357
Old Moulton, 2 miles northwest of; spike in front of 12-inch leaning post oak tree west side of road	354.39
Old Moulton, 3 miles northwest of; spike in back of 20-inch post oak tree 3 feet east of road	337.71
Old Moulton, 4 miles northwest of; spike in front of 12-inch post oak tree 10 feet west of road	329.89

	Feet.
Old Moulton, 5 miles northwest of; intersection of Waelder and Moulton and Gonzales and Flatonia (via Opossum Trot) roads, ¾ mile southeast of Peach Creek; iron post marked "SA 299"	298.886
Peach Creek, bed of	281
Old Moulton, 6 miles northwest of; spike in front of 12-inch post oak tree west side of road	347.05
Old Moulton, 7 miles northwest of; spike in front of 14-inch post oak tree west side of road	355.82
Old Moulton, about 8½ miles northwest of; spike in front of 16-inch post oak tree 20 feet west of road	363.73
Galveston, Harrisburg and San Antonio Railway road crossing, cattle guard No. 273	370.3

FROM A BENCH MARK 4½ MILES WEST OF SMITHVILLE TO ROSANKY, VIA LOCKHART BRANCH, MISSOURI, KANSAS AND TEXAS RAILWAY.

Trestle No. 1886, top of tie	462.2
Mile board 975, spike in front of first telegraph pole east of	475.91
Trestle No. 1889, top of tie	468.3
Mile board 976, spike in front of telegraph pole	464.95
Trestle No. 1891, top of tie	465.3
Smithville and Rosanky public road crossing, center of track	477.2
Mile board 977, spike in front of second telegraph pole west of	507.50
Trestle No. 1893, top of tie	510.9
Trestle No. 1895, top of tie	522.7
Mile board 978, spike in front of telegraph pole	510.95
Mile board 979, spike in back of third telegraph pole west of	520.18
Trestle No. 1899, top of tie	512.5
Rosanky, 120 yards west of railroad station, 50 feet south of the crossing of the Rosanky and Jeddo public road; iron post marked "SA 512"	512.103

ROSANKY, SOUTHWARD 9 MILES, VIA WAELDER AND BASTROP PUBLIC ROAD, TO CROSSING OF LAGRANGE AND LOCKHART PUBLIC ROAD, 1½ MILES WEST OF JEDDO.

Rosanky, 1 mile southwest of; spike in back of 14-inch post oak tree 40 feet south of forks of road	506.52
Rosanky, 1½ miles southwest of; 20 feet northeast of the intersection of the Waelder and Bastrop and Austin and Port Lavaca public roads; iron post marked "SA 468"	468.015
Rosanky, 2½ miles south of; spike in front of 12-inch post oak tree 6 feet west of road	514.89
Rosanky, 3½ miles south of; spike in north side of 16-inch post oak tree 1 foot east of road	551.05
Rosanky, 4½ miles south of; spike in front of 16-inch post oak tree 1 foot east of road	530.72
Rosanky, 5¾ miles south of; 45 feet southwest of forks of road and 1 mile north of Peach Creek; iron post marked "SA 516"	516.166
Peach Creek, bed of	457
Rosanky, 6½ miles south of; spike in front of 12-inch post oak tree 15 feet west of road, 120 yards south of Peach Creek	483.31
Rosanky, 7½ miles south of; spike in back of 12-inch post oak tree 10 feet west of road	512.86
Rosanky, 8½ miles south of; spike in north side of 12-inch post oak tree 10 feet west of road	512.80
Rosanky, 9 miles south of; 25 feet north of the crossing of the Waelder and Bastrop and La Grange and Lockhart public roads, 1½ miles west of Jeddo, 4½ miles east of Delhi; iron post marked "SA 536"	536.157

FROM A BENCH MARK 1¼ MILES WEST OF JEDDO AND AT CROSSING OF PUBLIC ROADS TO DELHI VIA LAGRANGE AND LOCKHART PUBLIC ROAD.

	Feet.
Jeddo, 2 miles west of; spike in front of 14-inch post oak tree 8 feet north of road	465.46
Copperas Creek, bed of	449
Delhi, 2½ miles east of; spike in root of double 12-inch post oak tree 3 feet south of road	459.66
Delhi, 1 mile east of; spike in back of 12-inch post oak tree 6 feet north of road, 50 feet east of crossroads	519.44
Delhi, 40 feet northeast of the crossing of the Lagrange and Lockhart and Waelder and Austin public roads; iron post marked "SA 535"	535.013

DELHI TO REDROCK VIA WAELDER AND AUSTIN PUBLIC ROAD TO WITHIN 3 MILES OF REDROCK, THENCE TO REDROCK BY THE STRAIGHT ROAD.

Delhi, 1½ miles north of, near tank; spike in front of 10-inch post oak tree 10 feet west of road	508.05
Delhi, 2½ miles north of; spike in root of 10-inch hickory tree 6 feet west of road	532.60
Delhi, 3½ miles north of; spike in front of 12-inch post oak tree 2 feet west of road	585.74
Summit of ridge, highest point in road between Delhi and Redrock	682
Delhi, 4½ miles northwest of; spike in front of 14-inch post oak tree 8 feet east of road	622.59
Delhi, 5½ miles northwest of; spike in front of 16-inch post oak tree 3 feet east of road	603.87
Delhi, 6½ miles northwest of; spike in root of 18-inch post oak tree 2 feet west of road	560.91
Delhi, 6¾ miles north of; forks of Waelder and Austin public road and a settlement road leading to Hoy Spring, and just southeast of house; iron post marked "SA 565"	564.990
Redrock, 3½ miles southeast of; spike in front of 16-inch post oak tree 4 feet west of road	568.64
Redrock, 2½ miles south of; spike in 16-inch post-oak tree, 60 feet north of intersection of the Redrock and Waelder public road with the Waelder and Austin public road	525.78
Redrock, 1¾ miles south of; spike in back of 12-inch post oak tree 5 feet east of road	486.41
Redrock, ¾ mile south of; spike in back of 16-inch post oak tree 8 feet east of road	517.69
Redrock, 1,200 feet southeast of passenger station on the Lockhart branch, Missouri, Kansas and Texas Railway, 125 feet south of track at the intersection of the Waelder and Redrock and Redrock and Rosanky public roads; iron post marked "SA 491"	490.981

REDROCK EASTERLY ALONG THE LOCKHART BRANCH OF MISSOURI, KANSAS AND TEXAS RAILWAY TO THE CROSSING OF THE PORT LAVACA AND AUSTIN PUBLIC ROAD, THENCE SOUTHEASTERLY ALONG SAID ROAD TO PUBLIC CROSSROADS, 1¼ MILES SOUTHWEST OF ROSANKY.

Redrock, ¼ mile southeast of station; center of track at crossing of Redrock and Rosanky road	498
Mile board 989, spike in front of telegraph pole ¼ mile east of Redrock	509.88
Trestle No. 1919, top of tie	521.8
Road crossing north of large windmill, center of track	528
Trestle No. 1918, top of tie	547.6
Road crossing, center of track	558.8
Mile board 988, spike in back of telegraph pole	565.93
Trestle No. 1916, top of tie	539.3

	Feet.
Trestle No. 1916, bed of branch	528
Mile board 987, spike in front of telegraph pole	532.62
Mile board 986, spike in front of telegraph pole	536.86
Trestle No. 1912, top of tie	524.9
Mile board 985; spike in front of telegraph pole	495.35
Trestle No. 1910, top of tie	472
Trestle No. 1908, top of tie	469.7
Redrock, 6 miles east of; 4 miles west of Rosanky, 1,100 feet east of section house, 45 feet southwest of settlement road crossing and about halfway between mile boards 983 and 984; iron post marked "SA 451"	450.901
Sandy Creek, bed of; trestle No. 1907	421
Mile board 983, spike in back of fifth telegraph pole east of	463.09
Trestle No. 1904, top of tie	484.6
Mile board 982, spike in back of telegraph pole	495.26
Port Lavaca and Austin road crossing, center of track at	489
Redrock, 8½ miles east of; about 1 mile southeast of Missouri, Kansas and Texas Railway, spike in 10-inch black-jack tree, 6 feet west of road	474.63

DELHI TO HARWOOD, VIA WAELDER AND AUSTIN PUBLIC ROAD FOR ¾ MILE, THENCE SOUTHWEST BY SETTLEMENT ROADS.

Delhi, ¾ mile south of; spike in 18-inch post oak tree 100 feet east of the forks of Waelder and Austin public road and a settlement road leading to Harwood	528.99
Delhi, 1¾ miles south of; spike in side of 12-inch post oak tree 8 feet west of road	509.52
Delhi, 3½ miles south of; spike in back of 14-inch leaning post oak tree 4 feet west of road	494.53
Delhi, 4 miles south of; spike in front of 16-inch post oak tree 5 feet east of road	484.86
Delhi, 4¾ miles southwest of; forks of Delhi and Harwood and Delhi and Thompsonville settlement roads; iron post marked "SA 500"	499.995
Delhi, 5¾ miles south of; spike in front of 16-inch post oak tree 8 feet east of road	468.38
Delhi, 6½ miles south of; spike in 6-inch mesquite tree 400 feet northeast of Gray's, 12 feet south of the crossing of the Delhi and Harwood settlement road, and the Waelder and Lockhart public road	470.75
The line here turns to west and follows the Waelder and Lockhart public road for 2¾ miles.	
Delhi, 7¾ miles south of; spike in back of 16 inch post oak tree 4 feet west of road	445.58
Sandy Fork, bed of; 75 feet below the mouth of Bear Branch	421
Delhi, 8¼ miles southwest of; 100 feet west of forks of public road to Lockhart and a settlement road to Luling; iron post marked "SA 515".	515.105
Delhi, 9¾ miles southwest of; spike in southeast side of 18-inch post oak tree 40 feet northwest of forks of road	517.48
Harwood, 5¾ miles north of; spike in west side of 18-inch post oak tree 5 feet west of forks of road and 50 feet south of old field	485.70
Harwood, 5 miles north of; spike in front of 16-inch post oak tree 2 feet west of road	434.73
Jower's Hollow, bed of	428
Harwood, 4¼ miles north of; 25 feet northwest of the crossing of the Waelder and Lockhart public road via Thompsonville; iron post marked "SA 460"	460.082
Harwood, 3¼ miles north of; spike in north side of 6-inch blackjack tree 6 feet north of road	461.50

	Feet.
Harwood, 2 miles north of; spike in front of 6-inch post oak tree 4 feet west of road	479.73
Harwood, ¾ mile north of; spike in front of post oak tree at mouth of lane	455.90

NICKEL POST-OFFICE SOUTHERLY TO BAILEY TRIANGULATION STATION, ALONG NICKEL AND DILWORTH PUBLIC ROAD.

Nickel, 1 mile south of; spike in front of 20-inch elm tree 25 feet west of road	363.66
Nickel, 2½ miles south of; spike in front of 20-inch post oak tree 25 feet east of road	387.77
Nickel, 3½ miles south of; spike in front of 24-inch post oak tree 3 feet east of road and 300 feet southwest of schoolhouse	463.21
Nickel, 4 miles south of; spike in southeast corner of fence post at mouth of lane going to Shiner	417.70

BAILEY TRIANGULATION STATION TO WITTING, IN AN EASTERLY DIRECTION.

Nickel, 5 miles south of; iron post set for triangulation point at Bailey station; marked 595	594.659
Bailey triangulation station, 1 mile east of; spike in west side of swing post to double gate	548.39
Bailey triangulation station, 2 miles east of; spike in wire fence corner post north side of road	506.95
Bailey triangulation station, 2½ miles east of; top of galvanized pipe set on northeast line of Gonzales County and northwest line of Lavaca County 20 feet south of fence corner	530.95
Bailey triangulation station, 3½ miles east of; on east side of old public road, 15 feet south of gate entrance to pasture, settlement road leading to Witting, about 300 feet east of Bill Dixon's residence; iron post marked "SA 516"	516.033
Bailey triangulation station, 4½ miles east of; spike in 12-inch hackberry tree 45 feet north of road, 8 feet north of fence	458.67
Bailey triangulation station, 5½ miles east of; spike in corner fence post at the intersection of settlement road with the new Moulton and Shiner public road about ¼ mile west of the San Antonio and Aransas Pass Railway	364.43
Pontoon Creek, bed of	351
San Antonio and Aransas Pass Railway, center of track at road crossing, opposite two-story store	388.3
Bailey triangulation station, 6¼ miles east of; east side of New Moulton and Shiner road, 12 feet south of corner of fence at mouth of lane that goes to Witting, 100 feet east of San Antonio and Aransas Pass Railway, and about ½ mile south of mile board 135, 800 feet north of store; iron post marked "SA 403"	403.072
Witting, 5 miles west of; spike in northwest corner fence post at road crossing 7¼ miles east of Bailey triangulation station; signboard marked "Moulton 4 miles, Hallettsville 12 miles, Shiner 6½ miles"	378.86
Akrove schoolhouse, 1,900 feet southwest of; spike in northwest corner fence post at intersection of roads, 3¼ miles west of Witting	450.92
Witting, 2¼ miles west of; spike in southeast gatepost east side of road	441.22
Witting, 1½ miles west of; tack in knot on northeast corner fence post at intersection of roads—one goes to Flatonia, one to Moulton, and one to Hallettsville; 6 miles southeast of Moulton	407.99

	Feet.
Witting post-office, ¼ mile northwest of; intersection of Hallettsville and Moulton and Witting and Flatonia public roads; signboard marked "Hallettsville 11 miles, Breslau 5 miles, Moulton 7 miles, Flatonia 15 miles;" iron post marked "SA 396"	396.051
WITTING TO MORAVIA.	
Witting, 1¼ miles northeast of; spike in corner fence post east side of road.	377.63
Witting, 2¾ miles northeast of; spike in large fence post west side of road, 150 feet south of Lavaca River	282.40
Lavaca River, bed of	258
Witting, 3¼ miles northeast of; spike in corner fence post east side of road, 15 feet northeast of gate	351.53
Witting, 4¾ miles northeast of; forks of the Witting and Flatonia and Witting and Moravia public roads; iron post marked "SA 363"	363.081
Live Oak Branch, bed of	318
Moravia, 2¾ miles southwest of; spike in north gatepost east side of road.	368.11
Boggy Creek, bed of	322
Moravia, 1¼ miles southwest of; spike in back of 30-inch live oak tree 20 feet west of road	374.29
Moravia, ¼ mile west of; near fence line at the intersection of the Witting and Moravia and Hallettsville and Flatonia public roads, 8¼ miles northeast of Witting; iron post marked "SA 405"	405.030
MORAVIA TO ENGLE, ALONG HALLETTSVILLE AND FLATONIA ROAD.	
Moravia, 1¼ miles northwest of; spike in back of 18-inch post oak tree standing in center of lane	399.30
Moravia, 2 miles northeast of; spike in front of 20-inch post oak tree 10 feet south of southeast corner of fence at crossroads	387.93
Rocky Creek, bed of	335
Moravia, 3 miles northeast of; spike in corner fence post east side of road.	407.42
Moravia, 4 miles north of; spike in front of 14-inch post oak tree standing in road, 250 feet south of Little Rock Creek	387.10
Little Rock Creek, bed of	373
Moravia, 4¼ miles north of; near the line dividing Lavaca and Fayette counties, and at the intersection of the Hallettsville and Flatonia and Schulenburg and Flatonia roads with a road to Engle; iron post marked "SA 411"	411.088
Moravia, 5¼ miles north of; spike in front of 10-inch post oak tree east side of lane	335.90
Engle, 2¼ miles south of; spike in east gatepost on south side of road	402.78
Engle, 1¼ miles south of; spike in corner fence post at the intersection of the Praha public roads	327.24
Engle, 200 feet northwest of station, 20 feet northwest of road crossing and 15 feet north of center of main track of Galveston, Harrisburg and San Antonio Railway; iron post marked "SA 374"	374.124
ENGLE TO FLATONIA, ALONG THE GALVESTON, HARRISBURG AND SAN ANTONIO RAILWAY.	
Trestle No. 327, top of tie	372.9
Mile board 115, spike in front of telegraph pole	377.47
Trestle No. 325, top of tie	398
Trestle No. 324, top of tie	408
Mile board 116, spike in back of third telegraph pole west of	427.30
Mile board 117, spike in back of telegraph pole	436.54
Road crossing	407.9

	Feet.
Mile board 118, spike in front of second telegraph pole east of	405.84
Trestle No. 317, top of tie	398
Mile board 119, spike in front of first telegraph pole east of	401.29
Trestle No. 309, top of tie	445
Trestle No. 308, top of tie	465.1
Flatonia, center of main track at station	462.4

HONDO QUADRANGLE.

SABINAL, SOUTH TO WOODARD'S RANCH, ON FRIO RIVER.

Sabinal and Friotown Road.

Sabinal, 1.9 miles south of; spike in 12-inch live oak tree in lane	917.08
Sabinal, 3.4 miles south of; intersection of Sabinal and Batesville and Sabinal and Friotown public roads; iron post marked "SA 894"	893.997
Rancharia Creek, bed of	826
Sabinal, 5.1 miles south of; spike in back of west gatepost	861.74
Sabinal, 6 miles south of; 20 feet west of road and 50 feet north of the northeast corner of old rock house; iron post marked "SA 844"	844.074
Sabinal, 7¼ miles south of; spike in front of hackberry tree on east side of road	814.67
Sabinal, 8½ miles south of; spike in back of west gatepost	820.26
Sabinal, 10 miles south of; intersection of Sabinal and Friotown and a ranch road, 1 mile north of Sabinal Creek crossing; iron post marked "SA 799"	799.090
Sabinal, 11 miles south of; spike in west gatepost at small field	774.17
Sabinal Creek, bed of	742
Sabinal, 12 miles south of; intersection of Sabinal and Friotown and Friotown and Uvalde public roads; iron post marked "SA 768"	768.045
Sabinal, 13 miles south of; spike in 12-inch mesquite tree 2 feet west of road	754.97
Sabinal, 14 miles south of; spike in 12-inch mesquite tree 5 feet east of road	741.90
Sabinal, 15.4 miles south of; intersection of Friotown public road and a road which crosses the Blanco Creek and the Frio River just above the mouth of Sabinal Creek; iron post marked "SA 723"	723.133
Sabinal Creek, bed of	688
Woodard's ranch, 9 miles northwest of; 16 miles south of Sabinal; spike in south gatepost just east of Hayler residence	731.20
Woodard's ranch, 8 miles northwest of; spike in 6-inch mesquite tree 2 feet east of road	718.69
Woodard's ranch, 7 miles north of; spike in 8-inch hackberry tree 5 feet west of road	707.51
Woodard's ranch, 6 miles north of; 200 feet south of slough and 15 feet west of road, near plain cattle trail; iron post marked "SA 706"	706.090
Woodard's ranch, 4.8 miles north of; spike in back of west gatepost	696.37
Woodard's ranch, 3¼ miles northwest of; spike in 6-inch mesquite tree 3 feet west of road	692.32
Frio River, bed of	640
Woodard's ranch, 2½ miles northwest of; spike in east gatepost at forks of road	697.37
Woodard's ranch, 2 miles northwest of; at forks of road near gate; right-hand road very dim; iron post marked "SA 692"	692.105
Woodard's ranch, 1 mile northwest of; spike in 6-inch mesquite tree 6 feet east of road	703.29
Woodard's ranch; spike in east gatepost at residence 5 miles northwest of Friotown and 25¼ miles southeast of Sabinal	663.60

	Feet.
Friotown, 3¼ miles north of; spike in 6-inch mesquite tree 10 feet east of road	660.69
Friotown, 3.1 miles north of; east side of road, at a point where road turns left to avoid mud hole; iron post marked "SA 653"	653.030
Friotown, 2.2 miles north of; spike in west gatepost	641.27
Friotown, 1.1 miles north of; spike in back of east gatepost	644.81
Friotown; in foundation wall, east side of north entrance to abandoned court-house; building now used as a store and post-office; copper bolt marked "SA 632"	632.466
Frio River, bed of; at Presidio Ford	594
Friotown, 0.7 mile east of; spike in west gatepost at entrance to Blackaller's pasture, top of north bank of Frio River, Presidio Ford	634.51

FRIOTOWN TO MOORE STATION, ON INTERNATIONAL AND GREAT NORTHERN RAILROAD, VIA HENSON RANCH.

Friotown, 2 miles east of; spike in 10-inch hackberry tree 10 feet west of road	630.53
Friotown, 2.8 miles east of; spike in north gatepost	621.35
Friotown, 3.8 miles east of; 125 feet north of gate on bank of Frio River, 15 feet south of road; iron post marked "SA 620"	620.108
Friotown, 5 miles east of; spike in 14-inch hackberry tree 5 feet north of road	605.50
Friotown, 6 miles east of; spike in 12-inch hackberry tree 12 feet south of road	603.14
Friotown, 6.9 miles east of; spike in back of 16-inch live oak tree, 15 feet north of road	593.58
Friotown, 7.1 miles east of; 25 feet north of four hackberry trees and 15 feet south of road; iron post marked "SA 591"	591.085
Friotown, 8.3 miles east of; spike in front of 8-inch mesquite tree 10 feet south of road	600.15
Friotown, 9½ miles east of; spike in gatepost, 500 feet east of windmill	574.89
Friotown, 10½ miles east of; 3 feet south of fence at road side, about 2 miles west of Hondo River; iron post marked "SA 594"	594.099
Friotown, 11½ miles east of; spike in fence post at angle 5 feet north of road, 1 mile west of Hondo River	588.80
Hondo River, bed of	561
Friotown, 12½ miles east of; spike in 12-inch elm tree, north side of road, 150 feet east of Hondo River; tree used as gatepost	573.98
Friotown, 13.6 miles east of; at forks of Friotown and Moore and Friotown and Pearsall roads, 300 feet southeast of Henson ranch residence; iron post marked "SA 615"	615.098
Henson ranch, 1 mile east of; spike in 7-inch mesquite tree 15 feet north of road	662.84
Forks of road, center of; right hand to Eden, left hand to Moore	658
Henson ranch, 2 miles east of; spike in 8-inch mesquite tree 5 feet south of road	674.22
Henson ranch, 3½ miles east of; intersection of Pearsall and Hondo public road and Friotown and Moore Station road; iron post marked "SA 696"	696.112
Henson ranch, 4½ miles east of; spike in 6-inch mesquite tree 5 feet south of road	713
Henson ranch, 5½ miles east of; spike in 3-foot live-oak tree 30 feet north of road	720.48
Henson ranch, 6.4 miles east of; spike in 6-inch mesquite tree 8 feet north of road	740.09

TEHUACANA SETTLEMENT ROAD TO MOORE STATION.

	Feet.
Moore, 4.3 miles west of; intersection of Friotown and Moore Station road, via Henson ranch, and the Tehuacana road, 20½ miles east of Friotown and 6.8 miles east of Henson ranch; iron post, marked "SA 710"..	710.159
Moore, 3½ miles west of; spike in fence corner post, 3 feet north of road..	766.52
Moore, 2.3 miles west of; spike in live oak (dead) 15 feet south of road..	764.80
Moore, 1½ miles west of; spike in 14-inch live oak tree 12 feet north of road	723.75
Moore station, International and Great Northern Railroad, center of track front of depot	658
Moore station, in front of; 25 feet south of main track; iron post marked "SA 660"	660.106
Moore, 6.4 miles west of; spike in 14-inch mesquite tree, 20 feet north of road, at the intersection of the Pearsall and Hondo public road, 200 feet east of iron bridge crossing the Hondo River	627.29
Hondo River, bed of	607

PEARSALL AND HONDO PUBLIC ROAD.

Hondo River iron bridge, ¼ mile northwest of; forks of Tehuacana and Moore road and Pearsall and Hondo public road; iron post marked "SA 626"	626.134
Hondo River iron bridge, 1.9 miles northwest of; spike in 8-inch live oak tree 5 feet east of road, about 200 feet west of house	619.47
Tehuacana Creek, bed of	614
Hondo River iron bridge, 2.3 miles northwest of; intersection of the Pearsall and Hondo public road and a road to Friotown, near schoolhouse, about 20 miles south of Hondo; iron post marked "SA 630"	630.059
Hondo River iron bridge, 3.4 miles northwest of: spike in back of 10-inch mesquite tree west side of lane	633.45
Hondo River iron bridge, 4½ miles northwest of; spike in fence corner post west side of road	640.14
Hondo River iron bridge, 5½ miles northwest of; spike in fence corner post north side of road	662.84
Hondo River iron bridge, 6½ miles northwest of; 25 feet north of Newton's gate, where the old Friotown and Castroville road enters Newton's pasture, 3 feet from fence in lane, west side of road; iron post marked "SA 656"	655.909
Intersection of roads, new-cut road entering from the west, center of	673
Hondo, 14½ miles south of; spike in 16-inch live oak tree in lane, west side of road	682.19
Intersection of roads, ground surface at center of; board on post marked "To gin 2 miles"	688
Hondo, 13.6 miles south of; spike in south gatepost east side of road	693.83
Hondo, 12.9 miles south of; spike in 14-inch live-oak tree east side of road.	714.69
Hondo, 11.3 miles south of; spike in 8-inch mesquite tree 25 feet east of gate	735.46
Hondo, 10.3 miles south of; spike in 16-inch mesquite tree west side of road	761.54
Hondo, 9.8 miles south of; angle of fence, east side of road, 500 feet south of East Fork of Tehuacana Creek and about ¼ mile northeast of Buck Hill; iron post marked "SA 761"	760.729
Tehuacana Creek, East Fork, bed of	759
Hondo, 8¾ miles south of; spike in north gatepost west side of road	816.05
Hondo, 8 miles south of; spike in 15-inch mesquite tree west side of road..	893 98
Hondo, 7 miles south of; spike in back of fence post, west side of road, top of first gravel ridge south of live-oak slough	803.88

	Feet.
Hondo, 6¾ miles south of; 20 feet south of live-oak slough, 8 feet from east fence and 40 feet south of three large oak trees; iron post marked "SA 782"	781.632
Hondo, 5.9 miles south of; spike in gatepost west side of road	807.16
Hondo, 5 miles south of; spike in 12-inch live-oak tree east side of road	815.90
Hondo, 3.8 miles south of; spike in mesquite tree east side of road	831.78
Hondo, 3¼ miles south of; corner of fence at intersection of roads; iron post marked "SA 840"	839.856
Hondo, 2.2 miles south of; spike in 8-inch mesquite tree west side of road	861.87
Hondo, 1.1 miles south of; spike in gatepost west side of road	870.60

THIRD-CLASS ROAD SOUTH FROM DUNLAY STATION, GALVESTON, HARRISBURG AND SAN ANTONIO RAILWAY, VIA BRIARBRANCH SETTLEMENT.

Dunlay, 0.8 mile south of; spike in west gatepost	985.29
Dunlay, 1.9 miles south of; spike in 10-inch mesquite tree 8 feet west of road	968.50
Dunlay, 2.9 miles south of; spike in fence corner post	946.35
Dunlay, 4 miles south of; spike in 8-inch live oak tree 15 feet west of road	936.91
Dunlay, 5.1 miles south of; spike in 10-inch live oak tree 5 feet west of road	921.76
Dunlay, 6½ miles south of; spike in northeast corner fence post at intersection of Dunlay and Briarbranch road and Quihe north-and-south road	910.69
Intersection of road, center of; Quihe north-and-south and Dunlay roads.	910
Dunlay, 7½ miles south of; spike in 12-inch live oak tree 15 feet west of Quihe and Devine road	818.01
Dunlay, 8½ miles south of; intersection of Quihe and Devine road and the old Friotown and Castroville road; iron post marked "SA 816"	816.010

QUIHE AND DEVINE ROAD.

Dunlay, 9.6 miles south of; spike in 10-inch mesquite tree used as fence corner post, southwest corner of lane which goes to Hondo	785.15
Dunlay, 10.4 miles south of; spike in southwest gate post where the old Friotown and Castroville road leaves the Quihe and Devine road	782.43

OLD FRIOTOWN AND CASTROVILLE ROAD.

Dunlay, 11 miles south of; 3.9 miles east of Hondo River crossing, intersection of roads, 125 feet north of gate; iron post marked "SA 775"	775.115
Hondo River crossing, 2¾ miles east of; spike in back of 16-inch mesquite tree 15 feet north of road	743.26
Hondo River crossing, 1½ miles east of; spike in 14-inch mesquite tree, 20 feet north of road	720.76
Hondo River, bed of	672
Hondo River, on west bank of; 10 feet east of road at the Readus crossing and 20 feet northeast of gate; iron post marked "SA 704"	704.049
Hondo River crossing, 1 mile west of; spike in 6-inch mesquite tree 8 feet east of road	766.37
Hondo River crossing, 2 miles west of; spike in 12-inch mesquite tree 6 feet north of road	738.06
Hondo River crossing, 3 miles west of; spike in 10-inch live oak tree 35 feet north of road	694.44
Hondo River crossing, 3.6 miles west of; spike in front of 2½-foot live oak tree 35 feet north of road	667.59
Tehuacana Creek, east prong, bed of	665

	Feet.
Hondo River crossing, 4¼ miles west of; spike in north gatepost	679.02
Tehuacana Creek, bed of	649
Seco Creek crossing, 3.8 miles northeast of; spike in east gatepost	682.37
Seco Creek crossing, 2.1 miles northeast of; forks of road 75 feet northeast of an old fence, with gatepost, but no gate; iron post marked "SA 697".	696.736
Seco Creek crossing, 1¼ miles northeast of; spike in back of west gatepost north side of road	681.24
Forks of roads, Friotown and Castroville and Friotown and San Antonio roads	646
Seco Creek, bed of	637
Seco Creek crossing, 250 feet west of; spike in south gatepost 25.3 miles southwest of Dunlay station	645.66

SETTLEMENT ROAD BRANCHING OFF THE OLD FRIOTOWN AND CASTROVILLE ROAD ¼ MILE WEST OF THE SECO CREEK CROSSING; THENCE IN A NORTHWESTERLY DIRECTION.

Seco Creek crossing, ¼ mile northwest of; spike in west gatepost	653.33
Seco Creek crossing, 1.6 miles northwest of; spike in front of live-oak tree 40 feet north of road	678.06
Squirrel Creek, bed of	650
Friotown and Hondo City county road, intersection of	663
Seco Creek crossing, 3 miles northwest of, at forks of Settlement and Friotown and Hondo county road; iron post marked "SA 678"	677.590

HONDO CITY AND FRIOTOWN PUBLIC ROAD, FOLLOWING DOWN SAME IN SOUTHWESTERLY DIRECTION TO BLACKALLER'S RANCH ROAD; THENCE DOWN SAME TO BLACKALLER'S RESIDENCE.

Blackaller's residence, 6.3 miles northeast of; spike in west gatepost, entrance to Blackaller's pasture, 3.9 miles northwest of Seco Creek crossing	702.72
Roads, forks of; Friotown and Hondo City county road and Blackaller's ranch road; left hand to Friotown, right hand to Blackaller's residence.	736
Blackaller's residence, 5¼ miles northeast of; spike in root of mesquite tree 65 feet south of road	688.06
Blackaller's residence, 4 miles northeast of; at side of road where the present road leaves the old one on account of wash, returning to same a short distance below; iron post marked "SA 666"	666.109

BLACKALLER'S RANCH ROAD.

Blackaller's residence, 3 miles northeast of; spike in three-pronged live-oak tree 25 feet north of road	652.11
Blackaller's residence, 2¼ miles northeast of; spike in 12-inch mesquite tree 6 feet south of road	647.72
Blackaller's residence, 1¼ miles northeast of; spike in 6-inch mesquite tree 60 feet north of road	653.45
Blackaller's residence, 0.4 mile northeast of; spike in 8-inch mesquite tree 6 feet south of road	658.46
Blackaller's residence, 400 feet northeast of; spike in north side of 18-inch mesquite tree 50 feet south of road, ¼ mile north of Frio River, in southeast corner of the Felix Poor survey, Frio County, 10¼ miles west of where Friotown and Castroville road crosses the Seco Creek, and about 5 miles north of old Friotown	659.69

RANCH ROAD LEADING FROM BLACKALLER'S RESIDENCE TO CHARLES WOODARD'S RESIDENCE WEST OF FRIO RIVER.

Blackaller's residence, ¼ mile west of; 10.7 miles west of where the Friotown and Castroville road crosses the Seco River; spike in cypress gatepost	665.67
Frio River, bed of	612

RANCH ROAD LEADING SOUTHWEST FROM CHARLES WOODARD'S RESIDENCE TO THE FRIOTOWN AND UVALDE PUBLIC ROAD.

	Feet.
Charles Woodard's ranch, 1.2 miles southwest of; spike in 5-inch mesquite tree 10 feet east of road	675.53
Charles Woodard's ranch, 2½ miles southwest of; spike in three-pronged mesquite tree 10 feet west of road	689.54
Charles Woodard's ranch, 3½ miles southwest of; spike in 5-inch two-pronged mesquite tree 10 feet east of road	670.67
Charles Woodard's ranch, 4.3 miles southwest of; spike in 6-inch mesquite tree 6 feet west of road	666.60
Charles Woodard's ranch, 4.9 miles southwest of, and 4¼ miles west of Friotown; intersection of ranch road and the Friotown and Uvalde public road; iron post marked "SA 673"	673.417

FRIOTOWN AND UVALDE PUBLIC ROAD SOUTHEAST TO FRIOTOWN.

Friotown, 3½ miles northwest of; spike in north gatepost	664.92
Friotown, 2½ miles west of; spike in 12-inch mesquite tree 40 feet north of road	656.22
Friotown, 1½ miles west of; spike in 4-inch mesquite tree 10 feet south of road	668.94
Old road; summit of ridge	680

BLACKALLER'S RANCH NORTH TO D'HANIS, ON THE GALVESTON, HARRISBURG AND SAN ANTONIO RAILWAY, ALONG RANCH ROAD, VIA V. JOHNSON'S RESIDENCE.

Blackaller's ranch, 1 mile north of; spike in 12-inch mesquite tree	668.66
Blackaller's ranch, 2 miles north of; spike in 7-inch mesquite tree 2 feet east of road	668.35
Blackaller's ranch, 2.2 miles north of; spike in 8-inch mesquite tree 10 feet west of road, 400 feet north of slough	672.93
Blackaller's ranch, 3.1 miles north of; spike in 8-inch mesquite tree 6 feet west of road	711.38
Blackaller's ranch, 4½ miles north of; spike in 10-inch mesquite tree 30 feet west of road	747.99
Blackaller's ranch, 6 miles north of; 35 feet south of road, 80 feet south of Woodard's windmill, 200 feet east of mesquite pole fence running north and south in Woodard's pasture; iron post marked "SA 790"	790.089
Blackaller's ranch, 7 miles north of; spike in fence corner post at gap 50 feet west of road	856.52
Blackaller's ranch, 8 miles north of; spike in 18-inch mesquite stump 15 feet east of road	847.76
Roads, intersection of; at this point the Blackaller road intersects the road leaving the Friotown and Hondo City road near John Allen's residence leading to Sabinal via V. Johnson's residence	800
Blackaller's ranch, 9 miles north of; front of V. Johnson's residence, on road leading from Friotown and Hondo road, near John Allen's, to Sabinal via V. Johnson's, 2,000 feet south of Squirrel Creek; iron post marked "SA 815"	815.123
Squirrel Creek, bed of	794
V. Johnson's, 0.9 mile north of; spike in 6-inch mesquite tree 40 feet west of road	832.64
V. Johnson's, 1.8 miles north of; spike in west gatepost	862.95
V. Johnson's, 3 miles north of; spike in 6-inch mesquite tree 15 feet west of road	897.02
V. Johnson's, 3½ miles north of, and 9¼ miles southwest of D'Hanis; in corner of fence 10 feet east of gate; iron post marked "SA 925"	925.086
D'Hanis, 8½ miles southwest of; spike in 7-inch mesquite tree 8 feet east of road	973.85

	Feet.
D'Hanis, 8 miles southwest of; spike in back of east gatepost	976.46
D'Hanis, 7 miles southwest of; spike in root of four-pronged live-oak tree 25 feet west of road	974.63
D'Hanis, 6½ miles southwest of; at forks of road, 50 feet south of gate, fence running east and west; iron post marked "SA 966"	966.127
D'Hanis, 5½ miles southwest of; spike in back of 16-inch live-oak tree 25 feet west of road, 50 feet north of fence corner	996.54
D'Hanis, 4½ miles southwest of; spike in 10-inch live-oak tree 5 feet east of road, 150 feet northeast of mouth of lane	1,018.18
D'Hanis, 3 miles southwest of; spike in root of 20-inch live-oak tree in lane, branded 1895; top cut off	1,023.49
D'Hanis, 2 miles southwest of; spike in west gatepost south side of lane.	881.89
Seco Creek, bed of at road crossing	848
D'Hanis, 1 mile southwest of; spike in root of 15-inch hackberry tree 5 feet east of road near Seco River crossing	875.09

COMMENCING AT MILE BOARD NO. 266 ON GALVESTON, HARRISBURG AND SAN ANTONIO RAILWAY, ABOUT 1½ MILES EAST OF D'HANIS STATION, THENCE WEST ALONG SAID RAILWAY TO FIRST ROAD CROSSING, THENCE SOUTHEAST THROUGH OLD D'HANIS ALONG ROAD LEADING TO JOHN FOHN'S RANCH TO THE FRIOTOWN AND HONDO PUBLIC ROAD.

Mile board No. 266, 1.1 miles south of; spike in northeast fence corner post brace at intersection of lanes	893.63
Mile board No. 266, 2 miles south of; spike in back of west gatepost	903.90
Mile board No. 266, 2.8 miles south of; spike in fence corner post at summit of hill east side of road	959.90

RANCH ROAD LEADING TO JOHN FOHN'S RANCH, SOUTHEAST TO OLD D'HANIS.

Mile board No. 266, 3.8 miles southeast of; spike in root of 5-inch mesquite tree 10 feet east of road	985.79
Mile board No. 266, 4½ miles southeast of; near gate 10 feet west of road, 1½ feet north of fence; iron post marked "SA 981"	980.962
Mile board No. 266, 5½ miles southeast of; spike in crotch of two-pronged mesquite tree, used as gatepost, west side of road	937.05
Mile board No. 266, 6½ miles southeast of; spike in crotch of mesquite tree 10 feet east of road	893.35
Mile board No. 266, 8 miles southeast of; spike in back of 6-inch mesquite tree 3 feet west of road	856.69
Mile board No. 266, 9 miles southeast of; spike in 14-inch mesquite tree 12 feet east of road	830.98
Mile board No. 266, 9¼ miles southeast of; 8¼ miles southwest of Hondo, intersection of roads, east of Fohn's road and south of Major Moore's ranch road to Hondo City (Fohn road crosses the Hondo and Friotown third-class public road about ¼ mile southeast of bench mark); iron post marked "SA 848"	848.131
Intersection of the Hondo and Friotown third-class public road and John Fohn's ranch road to D'Hanis	838

HONDO AND FRIOTOWN THIRD-CLASS PUBLIC ROAD, SOUTHWESTERLY TO CAPT. J. D. SMITH'S RANCH ROAD.

Signboard marked "Hondo 9 miles," center of road opposite	808
John Fohn's ranch road, 1.1 miles south of; spike in 10-inch live oak tree 15 feet east of road	789.85
Forks of road, center of; 1.6 miles south of Fohn's road to D'Hanis; right-hand to Capt. J. D. Smith's, left-hand to Friotown	777

RANCH ROAD LEADING WESTERLY FROM THE HONDO AND FRIOTOWN THIRD-CLASS PUBLIC ROAD TO V. JOHNSON'S, ON SQUIRREL CREEK, VIA CAPT. J. D. SMITH'S RESIDENCE.

	Feet.
Seco Creek crossing, 4.8 miles east of; spike in 12-inch mesquite tree 25 feet east of road	819.21
Seco Creek crossing, 3½ miles east of; spike in 15-inch mesquite tree 15 feet east of road	771.43
Seco Creek crossing, 2.4 miles east of; at Capt. J. D. Smith's residence, 50 feet north of road, 50 feet from southeast corner of house, 65 feet northwest of 20-inch mesquite tree; iron post marked "SA 777"	777.603
Seco Creek crossing, 1.4 miles east of; spike in south gatepost about 500 feet west of small ranch house	763.80
Seco Creek crossing, about 200 feet east of; spike in back of 7-inch mesquite tree 6 feet north of road	757.01
Seco Creek, bed of	738
Seco Creek crossing, 1.1 miles west of; spike in 8-inch mesquite tree 25 feet south of road	825.44
Seco Creek crossing, 2½ miles west of; 25 feet south of road, 25 feet west of branch, ½ mile northwest of High Hill Point; iron post marked "SA 789"	789.378
Squirrel Creek, east prong; bed of	758
V. Johnson's ranch, 3 miles east of; spike in 12-inch mesquite tree, 15 feet north of road, on west bank of east branch of Squirrel Creek; windmill 200 feet north	764.65
V Johnson's ranch, 2 miles east of; spike in 10-inch elm tree, 15 feet north of road, 15 feet west of branch	782.82
V. Johnson's ranch, 1½ miles east of; spike in north gatepost of north and south division fence between J. D. Smith and V. Johnson	815.02
V Johnson's ranch, 0.3 mile east of; spike in root of three-pronged mesquite tree, 25 feet west of road 200 feet west of Squirrel Creek	793.93
Squirrel Creek, bed of	784

PACIFIC SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. R. U. Goode, geographer in charge, seven leveling parties were engaged at various times during the year in running lines of spirit levels for the control of the topographic work being executed in the various localities.

UTAH.

UTAH AND JUAB COUNTIES.

TINTIC QUADRANGLE.

The elevations in the following list are based on an iron post set in the ground at the northeast corner of the court-house at Eureka and marked "6394." The height of this post is derived from the elevation of a tie directly in front of the waiting-room door of the depot of the Oregon Short Line Railroad at Eureka, given as 6,387 feet by the railway officials. From this the elevation of the central datum point has been accepted as 6,394.453 feet above mean sea level.

The leveling was done under the general direction of Mr. R. B. Marshall, topographer, by Mr. A. B. Searle, topographer.

EUREKA TO DIAMOND DIVIDE, VIA ROBINSON, SILVER CITY, AND DIAMOND.

	Feet.
Adams's planing mill; nail in tie just east of wagon road south of	6,289.6
"54 Mile Post;" nail head in tie directly south of	6,173.6
Junction of Oregon Short Line Railroad and Rio Grande Western Railway; nail in tie	6,177.59
Robinson, at southeast corner of lawn at Hotel Mammoth; iron post marked "6382"	6,381.755
Silver City; nail in tie directly east of old depot, now used as dwelling	6,092.6
Diamond, at west end of, at fence corner near road forks; nail in top of stake, about 2 inches above ground	6,211.5
Diamond, at northwest corner of lot and in the southeast angle of cross streets in center of town; iron post marked "6240"	6,240.417
Water Canyon, about 1½ miles east of Diamond; stake in ground in little bunch of maples near small ravine	6,523.8
Diamond Divide, near large rock at base of small cedar tree at east end of long flat near head of Water and Government canyons; iron post marked "6790"	6,789.505

DIAMOND DIVIDE TO EUREKA, VIA GOVERNMENT CANYON, IRON SPUR, AND HOMANSVILLE.

Goshen Valley; stake driven flush with ground where road (old Government trail) crosses dry drainage at a point about 1 mile north of west from Thayer's ranch	5,132.5
Goshen Valley, northwest corner T. 11 S., R. 1 W.; iron post marked "4793"	4,793.136
Goshen Valley, at junction of main Goshen and Tintic road with old Government trail; stake in the northwest corner of roads 1 mile south of Iron Spur and 4½ miles west of Goshen	4,899.9
Iron Spur, just west of; on nail head in tie on Rio Grande Western Railway where old Government trail crosses	4,828.1
Goshen Valley, at northwest corner T. 10 S., R. 1 W.; iron post marked "4978"	4,978.475
Pinon Canyon; stake on south side of wagon road at point of spur directly south of water tank at Lyoma, on Rio Grande Western Railway	5,380.5
Homansville, about ¼ mile east of; stake at base of whistling post of Rio Grande Western Railway	6,193.5
Homansville; stake in northwest corner of fence at dwelling at Eureka pump house	6,301.6
Summit; on nail head in sill at switch	6,370
Eureka depot, Rio Grande Western Railway; on tie directly in front of waiting-room door	6,447.8

SILVER CITY, DOWN TINTIC VALLEY, TO VICINITY OF M'INTIRE'S RANCH.

Sec. 14, T. 11 S., R. 3 W., near northwest corner of; junction of roads from Silver City and road from Mammoth leading to McIntire's ranch, west side of old grade of Rio Grande Western Railway, about 500 feet north of trestle; iron post marked "5686"	5,686.418
Sec. 11, T. 12 S., R. 3 W., in the southeast ¼ of the northwest ¼ of; on north side of draw in angle formed by road from McIntire's ranch and old road leading off northeast; iron post marked "5771"	5,771.368

UP COPPEROPOLIS CREEK.

T. 12 S., R. 3 W., northeast corner of; at mound of earth just south of wagon road at junction of drainages; iron post marked "6124"	6,124.419

UP KIMBALL CREEK.

	Feet.
Big and Little Dog canyons, near junction of; on east side of wagon road and on west side of drainage and about ¼ mile north of junction of stream; iron post marked "5739"	5,739.079
Cottonwood Canyon, head of; about 600 feet east of wagon road and about 250 feet north of Juab and Utah County line, under lone tree; iron post marked "6228"	6,228.089

IDAHO.

KOOTENAI COUNTY.

The elevations in the following list are based on an iron post marked "2077" and set at Priest River, a station on the Great Northern Railway, at northeast corner of fence around hotel south of depot. The initial elevation on which the work in this locality rests is the north rail of main line of Great Northern Railway opposite the depot, determined as 2,075 feet above mean sea level. Based on this the elevation of the central datum point has been accepted as 2,077 feet above mean sea level.

The leveling was done by Mr. Charles Harlowe, jr., levelman, under the general direction of Mr. D. C. Harrison, topographer.

ROAD FROM PRIEST RIVER STATION TO COOLIN POST-OFFICE, AT THE FOOT OF PRIEST LAKE.

	Feet.
Schoolhouse, near trail from; at base of yellow pine	2,109.18
Schoolhouse, where trail from, joins road; on red fir	2,165.83
Italian's farmhouse, in rear of; on top of stump near road	2,246.14
Common's ranch, 75 yards west of; at base of small red fir and near branch of road	2,290
Common's ranch, near trail from, to road; on tamarack 1 inch in diameter	2,384.25
Kaiser's ranch, at junction of road from; on base of red fir 1½ feet in diameter	2,368.58
Italian's ranch, 200 yards north of; west side of road; on tamarack 2 inches in diameter	2,351.93
Tps. 56 and 57 N., R. 4 W., line between; 5 yards west of road; iron post marked "2371"	2,370.608
Crazy Creek, 300 yards north of; on small tamarack tree to east of road	2,369.83
Cedar 2½ feet in diameter, on root of, east side of road	2,374.73
Pine Creek, 10 yards south of; on east side of road, at base of 20-inch hemlock	2,310.96
Cedar 2 feet in diameter, on root of, east side of road	2,271.57
Blue Lake Creek; middle of bridge over	2,231.27
Long's ranch, at junction with road to; on red fir 1 inch in diameter	2,270.65
Taylor's cabin, southeast corner of	2,316.63
White pine 3 feet in diameter and 5 feet east of road	2,457.06
Small Creek, 15 yards south of; on top of stump on east side of road	2,353.84
Big Creek, at beginning of south slope of road toward; on cedar 2 inches in diameter	2,355.14
Tps. 57 and 58 N., R. 4 W., on division line between; 5 yards west of road; iron post marked "2405"	2,405.300
Fox's ranch, junction of road to; on base of white pine	2,405.91
Benton's ranch; on southeast corner of second bridge south of	2,321.24

	Feet.
Billy Creek; southwest corner of bridge across	2,292.08
Billy Creek, near; on root of hemlock west of road	2,308.58
Benton's cabin, northwest corner of; on stake 4 feet above ground surface.	2,380.3
Benton's ranch, 200 yards north of; on base of small black pine east of road	2,308.80
East River; water level at bridge on road	2,255
Lee's cabin, 50 yards east of and 30 yards east of road; on tamarack 1 inch in diameter	2,308.7
East River, where road commences to slope from the north toward; at base of small tamarack on west side of road	2,411.1
Tps. 58 and 59 N., R. 4 W., on line between, and 4 yards west of road; iron post marked "2543"	2,542.549
Black pine, at base of, east side of road	2,566.80
Red fir, at base of, on east side of road	2,581.42
Mrs. Zetta Jones's ranch, 200 yards south of; on red fir, west side of road.	2,494.31
Beaver Creek; water level, where road crosses	2,485
Coolin; 75 yards southeast of house, 5 yards east of road; at base of white pine	2,511.29
Coolin; 75 yards south of house, 15 yards west of road; on red fir	2,509.55
Coolin; northwest corner of fence, 30 yards from lake shore; at base of black pine	2,444.93
Coolin; northwest of northwest corner of fence, 15 yards from edge of lake; iron post marked "2442"	2,441.628
Priest Lake; water surface	2,434
Triangulation station foot of Priest Lake, 15 yards north of; on base of black pine 1½ feet in diameter and 15 yards from water's edge	2,439.47
Triangulation station, iron post marking; 200 yards south of Coolin	2,439.761

(A line of levels was run from the upper or north end of Priest Lake to the south end of the upper or smaller lake, the result being a difference of 1.168 feet.)

MONTANA.

RAVALLI COUNTY.

HAMILTON QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in the top of the astronomical pier of the United States Geological Survey. The pier is on the east side of the track and in front of the depot of the Northern Pacific Railroad, in Hamilton, Montana, and the tablet is marked "3524." The elevation of this bench mark was accepted as 3,524.500 feet, and was determined from the top of the rail in front of the depot of the Northern Pacific Railroad in Grantsdale, which was given as 3,592.7 feet, as a result of an adjustment of the profiles of the Northern Pacific Railroad referred to mean sea level.

The leveling was done under the direction of Mr. E. C. Barnard, topographer, by Mr. C. M. Kurtz, levelman.

HAMILTON, VIA NORTHERN PACIFIC RAILROAD, TO GRANTSDALE.

Hamilton; in top of astronomical pier of United States Geological Survey, on east side of Northern Pacific Railroad opposite depot; bronze tablet marked "3524"	3,524.500

	Feet.
Hamilton, 1 mile south of; head of nail in a plug close to fence post west side of road opposite signpost "1 mile to Hamilton"	3,548.76
Grantsdale depot, 1 mile north of; head of nail in a plug close to fence at northwest corner of Northern Pacific Railroad right of way and cross-road	3,563.45
Grantsdale; top of rail nearest Grantsdale depot in front of baggage room door	3,592.7
Grantsdale; on north side of schoolhouse, 11 feet 8½ inches from the northeast corner; bronze tablet marked "3627"	3,627.455

GRANTSDALE, VIA COMO AND DARBY, TO FORK BRIDGE.

Grantsdale; head of nail in plug at third post south of corner of fence diagonally opposite crossroad from church	3,606.42
Grantsdale, ¼ mile south of; head of nail in plug close to corner fence post at turn of road south of south base	3,594.34
Grantsdale, 1 mile south of; head of nail in plug close to fence post, 100 feet north of the Daly Republican ditch on the east side of the road	3,597.37
Grantsdale; first hill sloping south after leaving; head of nail in plug next to fence post on west side of road	3,627.43
Grantsdale, 2 miles south of; crosscut in top of large white bowlder south side of road 100 feet east of crib work protecting Daly ditch	3,611.62
Sleeping Child Hot Springs road, junction with main road, cross cut in stone at, 2½ miles south of Grantsdale	3,635.26
Sleeping Child Hot Springs road, 3 feet inside of rail fence and 2 feet 10 inches southwest of a signpost reading "9 miles to Sleeping Child Hot Springs," 2½ miles south of Grantsdale; iron post marked "3636"	3,636.308
Sleeping Child Creek; head of nail in the seat of bridge over, 2½ miles south of Grantsdale	3,621.49
Sleeping Child Creek; 40 feet north of bridge over dry ravine above; head of nail in small pine-tree stump	3,658.39
Sheep Flat; T cut in higher part of a granite bowlder adjacent to the river side of road, 50 feet north of sharp bend 3 miles south of Grantsdale	3,654.19
Sheep Flat, 300 feet south of; head of nail on a small pine stump east side of road	3,659.80
McKinney's, north of; head of nail in floor beam of bridge near house half built	3,278.70
Walpert ranch, ¼ mile north of; head of nail in bench cut in root of large pine tree about 45 feet west of road	3,678.03
Walpert ranch, ½ mile south of; head of nail in seat of south end of bridge over a dry ravine	3,767.78
Como, ¾ mile north of; small circular projection on a large piece of granite east side of road	3,752.94
Logan's ranch; highest point on a 14-inch by 18-inch rock near road	3,726.97
Harlans bridge; head of a driftbolt on beam lower side of east abutment of bridge	3,741.25
Harlans bridge, junction of roads just west of; head of nail in center of a low stump south and east side of road	3,731.90
Harlans bridge, ½ mile above; at junction of road from Lost Horse with main road in a field on north side of a road 3 feet from fence and 47 feet S. 50° W. (magnetic) from a large pine tree in same field; iron post marked "3731"	3,730.899
Como Lake road, junction with main road; head of nail in plug in corner of fence north side of road	3,778.44
Rock Creek bridge, 1 mile south of; head of nail in bench cut in large pine tree (N.P.R.R.B.M.) west side of road	3,767.94

	Feet.
Nicholson's house, 1,000 feet south of; head of nail in plug near a barbed-wire fence post on east side of road	3,776.4
Waddel's house, just south of lane to; head of nail in plug near fence west side of road	3,788.8
Corner of secs. 34 and 35 of T. 4 N., R. 21 W., and secs. 2 and 3 of T. 3 N., R. 21 W., 200 feet south of; head of nail in bench cut in pine tree	3,801.93
Corner of secs. 34 and 35, T. 4 N., R. 21 W., and secs. 2 and 3, T. 3 N., R. 21 W., 35 feet west and 20 feet north of; iron post marked "3802"	3,801.890
Darby; head of nail in plug at corner of board fence in front of first house north of Darby schoolhouse	3,825.4
Darby; head of nail in plug at northeast corner of Darby drug store	3,831.1
Darby; 4 feet 8 inches east of northwest corner of fence in yard of Hammond's hotel and 17½ feet north of same; iron post marked "3832"	3,832.156
Tin Cup Creek, ¼ mile north of crossing of; head of nail in cone at base of a large stump near west side of road	3,851.15
Tin Cup Creek, ¼ mile south of crossing of; head of nail in cone on north side of large pine tree near road, between a ditch and private road	3,879.15
McCoy's, ½ mile south of; a cross cut in large rock lying partly under the fence	3,914.97
Fork bridge, ¼ mile north of; on west side of pine tree east side of road	3,895.1
Fork bridge; head of nail in timber of foundation north side of west approach to bridge	3,900.68
Fork bridge; 91½ feet west of west end of approach to bridge and west of road at junction of the East and West Fork roads and in line with south truss of bridge; iron post, marked "3903"	3,902.733

FORK BRIDGE, UP EAST FORK, VIA EVELYN TO LULA.

Rye Creek, just south of; head of nail in root of large cottonwood tree near ditch crossing road	3,939.38
Robbins, ¼ mile south of; head of nail in plug set inside of a fence corner at turn of road	3,949.7
First East Fork bridge, 350 feet east of; head of nail in north side of large pine tree	3,977.01
Evelyn, just north of; 174 feet west of the west abutment of first bridge over East Fork; iron post, marked "4033"	4,033.099
Harris's ranch, opposite; head of nail in bench cut in pine-tree stump	4,040.91
Evelyn, just south of; head of nail in bench cut in root of a pine stump 140 feet west of the second bridge over East Fork	4,028.81
Evelyn, ¼ mile south of; on a marked stone near a stump near the road	4,057.8
Medicine Tree; head of nail in a large pine tree near, on river side of road	4,082.09
Jenning's ranch, just south of; head of nail in root of a stump north side of road in the field near turn in road	4,117.42
Beam's ranch, ¼ mile south of; head of nail at base of burnt stump east side of road	4,150.20
Laird's barn, in front of; head of nail in root of large tree near road	4,205.75
Schoolhouse, in sec. 2, T. 1 N., R. 20 W., 70 feet east of and 40 feet from road running east and west; iron post marked "4194"	4,194.007
Upper Laird ranch, ¼ mile north of; head of nail in root of large pine tree	4,217.39
Wilde's Hot Springs road, junction with main road; head of nail in bench cut in root of fir stump	4,241.21
Wilde's Hot Springs road; head of nail in bench cut in large dead pine tree near ford of East Fork	4,271.95
Jim Hell rock, ¼ mile south of; head of nail in bench cut in fir stump near road	4,313.39

	Feet.
Jim Hell rock, ¼ mile south of; head of nail in bench cut in north side of stump near road	4,344.53
Lula post-office, ¼ mile north of; highest point of 12 by 18 inch rock 7 feet east of a blazed stump west side of road	4,381.60
Ross Hole; section corner 8, 9, 16, and 17, T. 1 N., R. 19 W., head of nail in plug driven 6 inches from section corner	4,383.9
Ross Hole; section corner 8, 9, 16, and 17, T. 1 N., R. 19 W., 3½ feet north of; iron post marked "4384"	4,384.146

FORK BRIDGE, UP WEST FORK TO ROMBO FLATS.

Fork Bridge, 1 mile south of; head of nail on a large pine tree near west side of road, 150 feet north of trees witnessing school lands	3,948.68
Sirra's ranch, ¼ mile south of; head of nail in bench cut in large pine tree at road intersection	3,973.04
Burch's ranch, ¼ mile north of; head of nail in top of small pine stump west side of road	3,991.5
Burch's ranch, ¼ mile south of; head of nail in tree east side of road	4,020.48
Burch's ranch, just above; head of nail in pine tree in field halfway between road and river toward the ford	4,019.33
Burch's ranch, 1¼ miles south of; head of nail in north side of fir stump 200 feet from log cabin	4,024.45
Van Sickle's, just north of; head of nail in large pine tree north side of road near logging camp	4,060.35
Trapper Creek Bridge, ¼ mile north of; head of nail in bench cut in stump west side of road (an old railroad bench mark)	4,084.61
Cameron's ranch, east side of, near fence; head of nail in pine tree	4,121.92
Cameron's, about halfway up the hill; head of nail in bench cut in pine stump	4,212.04
Baker's, south of; head of nail in bench cut in fir tree south side of road.	4,171.90
Christensen's ranch, ¼ mile north of; head of nail in pine tree south side of road	4,200.97
Christensen's ranch, ¼ mile south of; head of nail in bench cut in fir stump 7 feet west of road	4,216.07
Calamity Hill, at base of; head of nail in a fir tree near west side of road, 1,000 feet north of old ford	4,270.17
Boulder Creek, head of nail on fir tree at bridge over	4,280.09
Bowlder Creek, first creek south of; head of nail in bench cut in fir tree west side of road, 250 feet north of the mouth of creek	4,317.34
Cameron's ranch, near summit of hill above, at corner of secs. 33 and 34, T. 2 N., and 3 and 4, T 1 N., R. 21 W.; iron post marked "4326"	4,325.521
South Fork, mouth of; head of nail in bench cut in fir tree west side of road near junction of west and south forks	4,344.39
South and West Fork roads, junction of; head of nail in bench cut in fir tree at	4,349.74
Rombo Flats, at south section corner, between secs. 36, T. 1 N., R. 22 W., and 31, T. 1 N., R. 21 W.; iron post marked "4382"	4,382.005

FROM MAIN ROAD, 4 MILES BELOW DARBY, UP ROCK CREEK VALLEY TO LAKE COMO.

Rock Creek Valley; stone marked with cross near summit of hill ¼ mile from main road	4,033.52
Lake Como, 1¼ miles below; cross cut on a large rock 250 feet north of road	4,008.86
Lake Como, between cattle corral and hotel; head of nail in bench cut in a large pine tree near the lake	4,153.98
Lake Como, in a large bowlder on bank of lake, between hotel and cattle corral, and 75 feet south of the road; copper bolt marked "U.S.G.S. 4167"	4,167.235

HAMILTON, EAST TO FOOTHILLS, SOUTH ALONG FOOTHILLS TO SKALKAHO CREEK AND HAMILTON WATERWORKS RESERVOIR, THENCE WEST TO GRANTSDALE.

	Feet.
Hamilton; head of nail in plug driven near fence east side of first road running north and south in Bitter Root stock farm, east of mile running track and at head of lane leading from judges' stand	3,525.05
Bitter Root stock farm; head of nail in plug driven near gatepost at foot of lane leading to residence of Sam Lucas	3,534.3
Sam Lucas, east of residence of; head of nail in plug driven near fence corner at southwest corner of road intersection	3,593.2
Murton's residence; head of nail in plug near fence of road running east toward the water tank of Bitter Root stock farm	3,643.3
Hammond's residence, ¼ mile west of; head of nail in plug driven at northwest corner of road intersection	3,685.6
Water tank, Bitter Root stock farm; head of nail in plug driven at southwest corner of turn in road at	3,726.2
Water tank, Bitter Root stock farm, foot of hill east of; highest and most easterly part of a large bowlder 70 feet west of largest of a clump of pine trees	3,883.15
Water tank, Bitter Root stock farm, ¼ mile south of; head of nail in plug driven near fence at southeast corner of road intersection	3,752
Winders, east of; head of nail in plug driven in ground at southwest corner of road intersection	3,797
Winders, south of; head of nail in plug driven near fence at base of foothill	3,839.8
Skalkaho Creek, north of, and east of Grantsdale; highest point of a large bowlder in a field about 600 feet west of the base of a long, narrow foothill	4,005
Hamilton waterworks reservoir, at head of a drift bolt inclosed in a square cut of timber downstream side of north pier of dam	3,772.06
Hamilton waterworks reservoir, in the north wall, 130 feet east of the northwest corner; iron post marked "3776"	3,776.111
Grantsdale, 1¼ miles east of; head of nail in plug driven near fence south side of road where a large irrigating ditch crosses same	3,703.6

MAIN ROAD TO SLEEPING CHILD HOT SPRINGS.

Sleeping Child Creek, 1 mile east of main road; a cross cut on the top of a rock lying on north side of road between a ditch and the road, near a rocky point	3,736.54
Whalen's residence, 300 yards east of; head of nail in plug driven in ground near a fence post on south side of road	3,779.6

HAMILTON, VIA NORTHERN PACIFIC RAILROAD, TO WOODSIDE.

Hamilton, 1 mile south of; head of nail in plug driven near fence on west side of railroad	3,497.7
North base, west of; head of nail in plug in fence corner east side of railroad	3,466.5
Blodgett Creek, trestle over; head of nail in bench cut in small fir stump 60 feet west of track near	3,451.59
Corvallis station, ¼ mile south of; top of bolt in cattle guard at road crossing	3,435.11
Woodside post-office (Corvallis station), 100 feet south of road crossing at; head of nail in plug driven near fence west side of railroad	3,438.3

WOODSIDE EAST, VIA CORVALLIS TO FOOTHILLS, THENCE NORTH, ALONG EAST EDGE OF VALLEY TO STEVENSVILLE.

Woodside, 1 mile east of; head of nail in plug at southwest corner of junction of roads and at southwest corner of sec. 32, T. 7 N., R. 20 W	3,420.55
Corvallis; head of nail top of a short post near fence corner opposite schoolhouse, southwest corner sec 33, T. 7 N., R. 20 W	3,428.7

	Feet.
Corvallis; under the front wing on the south side of the northwest corner of foundation of Corvallis schoolhouse; bronze tablet marked "3428".	3,427.692
Sec. 34, T. 7 N., R. 20 W., southwest corner of; head of nail in plug near fence, south side of road at, 1 mile east of Corvallis	3,475.7
Sec, 35, T. 7 N., R. 20 W., southwest corner of; highest projection of a rock 15 feet north of road, 2 miles east of Corvallis	3,552.94
Forks of road, 2½ miles east of Corvallis; top of bowlder lying in road 40 feet from north fence	3,604.40
Sec. 26, T. 7 N., R. 20 W., ¼ mile east of southwest corner of; highest projection of a rock on or near section line between secs. 26 and 35	3,642.32
Sec. 23, T. 7 N., R 20 W., southwest corner of; head of nail in plug near fence around claim shanty	3,631.8
Secs. 15, 14, and 22, 23, T. 7 N., R. 20 W., 3 feet northwest of corner of; iron post marked "3537"	3,536.624
Sec. 14, 7 N., R. 20 W., near middle of; head of nail in plug on south bank of dry ravine	3,562.9
Secs. 14 and 11, T. 7 N., R. 20 W., ¼ mile north of section line, on a rock 300 feet southwest of a claim shanty near Birch Creek	3,578.18
Sec. 11, T. 7 N., R. 20 W., northwest ¼ of; highest projection on a rock 500 feet east of claim shanty fence	3,558.98
Sec. 34, T. 7 N., R. 20 W., southwest corner of southeast quarter of; head of nail in plug north side of fence where fence turns to the south from the township line	3,369.4
Sec. 34, T. 8 N., R. 20 W., southwest corner of southeast quarter of; 4 feet north of fence on township line; iron post marked "3375"	3,374.569
Secs. 27 and 34, T. 8 N., R. 20 W., section line between; head of nail in plug near gate and fence at road skirting foothills	3,332.6
Sec. 22, T. 8 N., R. 20 W., southeast corner of; head of nail in plug near fence at	3,318.8
Sec. 15, T. 8 N., R. 20 W., 27 feet north of southeast corner of; head of nail in plug	3,321.4
Secs. 14, 15, 22, and 23, T. 8 N., R. 20 W., 30 feet 7 inches north of corner between; iron post mark "3322"	3,322.006
Secs. 10 and 15, T. 8 N., R. 20 W., terminus of road between; head of nail in plug near south fence	3,319.6
Secs. 3 and 10, T. 8 N., R. 20 W.; head of nail in plug near fence on north side of road between, 25 feet east of where first ditch east of main road to Stevensville crosses the road	3,308.9
Sec. 34, T. 9 N., R. 20 W. and sec. 3, T. 8 N., R. 20 W., township line between; head of nail in plug 600 feet east of main road to Stevensville	3,309.4
Secs. 34 and 27, T. 9 N., R. 20 W., line between; head of nail in plug inside of fence south side of road to Burnt Fork, 580 feet east of main road to Stevensville	3,292
Stevensville; top of lower staple, north side of door to jail	3,272.28
Stevensville, on east side of Ravalli County court-house, 2 feet from the southeast corner in wall of vault; bronze tablet marked "3271"	3,271.054

STEVENSVILLE TO CURLEW MINE, THENCE SOUTH ON WEST SIDE OF BITTER ROOT RIVER TO WOODSIDE.

Bitter Root River, 500 feet west of ford of, in sec. 33, T. 9 N., R. 20 W.; head of nail in bench cut in large pine tree, south side of road	3,231.35
Northern Pacific Railroad, 30-mile post to Missoula; head of nail in top of milepost	3,247.52
Northern Pacific Railroad, where township line between Tps. 8 and 9, R. 20 W., crosses same; head of nail in bench cut in large pine tree 70 feet east of track	3,245.67

	Feet.
Northern Pacific Railroad, where section line between secs. 5 and 8, T. 8 N., R. 20 W., crosses same; head of nail in top of post 41–B	3,280.47
Sec. 6, T. 8 N., R. 20 W., southeast corner of; head of nail in base of gate post	3,318.87
Secs. 1, 12, T. 8 N., R. 21 W., and 6, 7, T. 8 N., R. 20 W., corner of; head of nail in root of a large blazed pine tree 100 feet west of	3,496.38
Lower Big Creek, 60 feet north of edge of the bench just north of, in sec. 12, T. 8 N., R. 21 W.; head of nail in base of a pine tree 25 feet east of road	3,501.08
Curlew mine; head of nail in northeast corner of; 6 by 6 by 6 inch post 50 feet west of door to J. Wasson's house	3,541.50
Curlew mine, at northwest corner of office of; iron post marked "3533".	3,532.878
Sec. 24, T. 8 N., R. 20 W., ¼ mile east of northwest corner of; highest point on a large bowlder in field	3,568.52
Sec. 24, T. 8 N., R. 21 W., in southwest quarter of; top of the large bowlder in field	3,566.50
Sec. 24, T. 8 N., R. 21 W., near southwest corner of; highest projection of a solid rock surrounded by a monument of stones	3,581.20
Secs. 26, 27, and 34, 35, T. 8 N., R. 21 W., near corner of; top of stone in road 5 feet from west fence	3,522.66
Secs. 34 and 35, T. 8 N., R. 21 W., and 2 and 3, T. 7 N., R. 21 W., 12 feet west of corner of; head of nail in bench cut in large pine tree in road	3,613.99
Secs. 34, 35, T. 8 N., R. 21 W., and 3 and 2, T. 7 N., R. 21 W., 9 feet northeast of corner of; iron post marked "3614"	3,614.057
Sec. 11, T. 7 N., R. 21 W., in northwest quarter of; head of nail in bench mark nailed to a leaning pine tree 100 feet north of road corner	3,602.02
Sec. 14, T. 7 N., R. 21 W., ¼ mile due east of northwest corner of; head of nail in base of tree in middle of road intersection	3,626.59
Secs. 11, 12, 13, and 14, T. 7 N., R. 21 W., 20 feet south of corner stone, on an 18 by 18 inch solid rock	3,562.23
Sec. 13, T. 7 N., R. 21 W., southeast corner of northeast quarter of; head of nail in plug near fence east side of road at	3,431.1
Secs. 13 and 14, T. 7 N., R. 21 W., at corner between; head of nail in plug near fence on west side of road	3,420.2
Secs. 18 and 19, T. 7 N., R. 20 W., and secs. 13 and 24, T. 7 N., R. 21 W., 33 feet from corner of, 8 feet north of section line and 3 miles north of Woodside; iron post marked "3423"	3,422.998
Secs. 24 and 27, T. 7 N., R. 21 W., and secs. 19 and 30, T. 7 N., R. 20 W., southwest of corner of; head of nail in plug inside of fence corner 2 miles north of Woodside	3,402.9
Secs. 25 and 36, T. 7 N., R. 21 W., and secs. 30 and 31, T. 7 N., R. 20 W., corner of; head of nail in pine stump in road 1 mile north of Woodside	3,422.06
Woodside (Corvallis station); head of nail in plug near west fence Northern Pacific Railroad, 100 feet south of road crossing at station	3,438.3

WASHINGTON.

OKANOGAN AND DOUGLAS COUNTIES.

WATERVILLE QUADRANGLE.

The elevations in the following list are based on an iron post set at southwest corner of the intersection of Chelan avenue and First street at Chelan Falls, the post being marked "764." The elevation of this bench mark was determined from United States Engineer Corps bench

mark No. 32 at Chelan Falls on the Columbia River, set in 1895 by C. F. B. Haskell in connection with a line of levels established from the Northern Pacific Railway datum. This bench mark is on a granite rock 6 by 6 by 24 inches, set 20 inches in the ground near the northeast corner of the hotel. The elevation of this bench mark is given by Capt. Harry Taylor, Corps of Engineers, United States Army, as 763.10 above mean sea level.

The leveling was done under the direction of Mr. W. T. Griswold, topographer, by Mr. P. F. Byrne, levelman.

Road from Chelan Falls to Lakeside.

	Feet.
Chelan Falls; iron bench mark post above described, set 3 feet in ground, near the northeast corner of hotel	763.516
Chelan Falls; nail in top of porch of hotel	764.1
Chelan River; on top of rock near large rock bluff near head and left of gulch opening into	1,025.8
Burpee's ranch; highest point in road at	1,306
Burpee's ranch, top of rock 6 by 4 by 2 feet, in east side of coulee north of.	1,297.20
Coulee; top of rock 2 by 5 by 2 feet at north end of; 48 feet east from pine tree 15 inches in diameter near rock slide	1,209.210
Chelan City; top of bowlder near, 125 feet left of road opposite cut bank, Chelan River	1,237.80
Lake Chelan; near gate 100 feet from, on wire nail driven into root of pine tree	1,114.29
Lakeside; on nail in root of pine tree at Ben Smith's pump house	1,114.30
Lakeside; on nail in board on pine tree at steamer's wharf	1,116.4
Lakeside; water level at wharf 4 p. m., August 13, 1897	1,108
Lakeside; nail in top of post east of Captain Johnson's house	1,169.8
Lakeside; iron post set inside of Captain Johnson's fence about 100 feet from Lake Chelan, marked "1121"	1,120.996
Lakeside; water level Johnson's rock pier August 31, 1897	1,108

ROAD FROM LAKESIDE TO KNAPP'S FERRY.

Navarre's east fence; about 400 feet east of and about 60 feet south of road, top of large rock 6 feet high and 6 feet in diameter	1,175.57
Navarre's fence inclosing spring; northwest corner of	1,339
Knapp's coulee; highest point in road east of, 275 feet east from 36-mile stake of State road	1,504
Fosdick's gate; west end of Knapp's coulee on nail in stake driven at root of pine 3 feet in diameter in road	1,428.9
State road; 35-mile stake of, on nail in top of pine stump 2 feet in diameter, 250 feet south of	1,495.51
Knapp's coulee; nail in top of pine stump at summit of road	1,604.64
Knapp's coulee; highest point in wagon road at summit	1,608
Knapp's coulee; 710 feet west of township corner between townships 26 and 27 north and ranges 21 and 22 east; iron post marked "1370"	1,370
Knapp's coulee; top of large bowlder 5 cubic yards on stage road, near northwest corner of cornfield	1,238.94
Knapp's coulee; stake 6 inches from gatepost at head of ravine leading to Knapp's ferry	1,206.5
Knapp's coulee; at 31-mile stake of State road	937.9
Knapp's coulee; top of rock on ridge half way down the road in gulch	907.44
Knapp's gate; on rock at	778.01

	Feet.
Knapp's warehouse; on rock 11.5 feet south from, southeast corner of; about high-water level June, 1894	736.73
Knapp's ferry; on right bank Columbia River at; 35 feet west from southwest corner of Knapp's warehouse, on south side of granite bowlder; iron post marked "739"	739.100
Water level, east bank Columbia River, August 23, 1897	697

ALONG LAKE CHELAN.

Lake Chelan; on stone across outlet of, just above wagon bridge	1,112.12
Rock Point; stake near corner of barn of L. H. Spader's ranch	1,116.9
Lake Chelan; water level on north side, 12.30 p. m., July 31, 1897	1,109
Berrier's ranch; on stake at gate	1,117.3
J. W. Watson's house; top of porch floor at northwest corner of	1,127
J. H. Watson's house; in small stump 8 feet from southwest corner of stable	1,125.4
Lake Chelan; at mouth of stream opposite Twenty-five Mile Creek	1,109
Triangulation station; ground elevation	1,835
Triangulation station; top of hub at signal	1,835.63

FROM HEAD OF LAKE CHELAN UP STEHEKIN RIVER TO CASCADE PASS.

Lake Chelan; water level	1,108
Lake Chelan; nail in top of stump near boat landing in bayou	1,114.9
Log Cabin; on rock in trail near head of Lake Chelan	1,115.8
Shiralle Cabin; on nail in top of post near northwest corner of, near trail	1,139
Old river channel; on stone, left of trail near	1,173.21
Two large fir trees; top of rock 20 feet north of, on open side hill; elevation marked on stake driven by rock	1,207.2
Bussard's gate; top of stake near second post	1,180.6
Rock slide, beginning of; on stone 5 feet from fir tree 2 feet in diameter	1,211.2
First rise in trail; top of rock 25 feet north from burnt tree stump	1,213.41
Large bowlder in channel of river; top of rock in trail near	1,219.08
Cabin on trail, ¼ mile south of; on large cottonwood 3 feet in diameter	1,232.5
Cabin on trail, 250 feet to right of; on stake driven flush with surface near fir tree	1,241
Pine tree 2 feet in diameter, 25 feet to right of trail; on top of stone 5 feet north from tree	1,315.77
Log in trail; top of stake at end of	1,279.6
Cabin, 545 feet beyond; nail in top of stake in trail; elevation marked on stake	1,300
Deserted cabin, 115 feet to right of trail; on nail in stump 5 feet from southwest corner of	1,350.75
Side of ravine; top of stone, 2 cubic yards, on right side of trail; elevation marked on stake	1,443.82
Fir tree 3 feet in diameter; at foot of, and 50 feet north of stream; top of stone 1 cubic foot	1,476.94
Cabin; on nail in top of stump 1 foot in diameter near foundation; small box on tree near by	1,419.27
Junction of the Agnes and Stehekin rivers; on nail in root of pine tree 2 feet in diameter and 105 feet north of river bank; tree stands in an open space about 1,000 feet east of junction of rivers, and the elevation is marked on a board nailed to a tree	1,518.1
Large fir tree 3 feet in diameter; on nail in root of	1,843.97
Twin Lake; highest point on trail near	2,199.3
Twin Lake; on highest point of rock 5 by 4 by 3 feet, between two pine trees each 4 feet in diameter; these trees are 20 feet apart and near dry outlet of lake	2,182.21

	Feet.
Narrow bridge on small stream; top of rock 6 by 5 by 3 feet at corner of.	2,030.81
Rock, 2 cubic feet, at left of trail, top of; elevation marked on stake....	2,259.1
Cabin; on nail in root of cedar 5 feet in diameter and 155 feet north from.	2,089.60
Stream; top of large rock 6 by 8 by 4, 60 feet north of; elevation marked on stake	2,175.96
Bridge Creek; stream flowing near buildings at; water level	2,132
Bridge Creek; on nail in root of fir 2½ feet in diameter, 225 feet south of new bridge	2,204.40
Bridge Creek; point of rock at west end of bridge	2,180.25
Bridge Creek; floor of bridge on middle of span	2,179
Bridge Creek; water level under middle of span	2,148
Small stream crossing trail; top of rock 2 by 3 by 5 feet at	2,200.09
Park Creek bridge; on nail in fir stump 1½ feet in diameter at west end of bridge	2,285.53
Top of rock 26 by 18 by 10 inches; on left of trail; elevation on stake at side of	2,450.03
State road camp on Stehekin River; 125 feet west of trail leading to, on top of rock 8 by 6 by 6 feet, 22 feet south from tree 3 feet in diameter...	2,718.99
Foot of hill; on top of rock, 1 cubic yard	3,009.41
Pershall's cabin; on nail in root of cottonwood tree 2 feet in diameter and 25 feet from northeast corner of cabin	3,131.48
Horseshoe Basin; Stehekin River crossing below	3,176
Horseshoe Basin; Stehekin River crossing below; water level	3,175
Upper branch of Stehekin River; crossing of, water level	4,081
Switchback trail; first angle in	4,222
Switchback trail; second angle in	4,360
Switchback trail; third angle in	4,429
Switchback trail; fourth angle in	4,532
Pass, at first summit of; on nail in root of hemlock tree	4,930.74
Summit; beginning of trail up to	4,961
Summit; beginning of rock slide at, on trail leading up to	5,001
Summit; iron post marked "5423"	5,423.100

KITTITAS COUNTY.

MOUNT STUART AND SNOQUALMIE QUADRANGLES.

The elevations in the following list are a continuation of those determined during the preceding field season, the results of which are published in the Eighteenth Annual Report, Part I, page 394. They are based on a bronze tablet set in the top of the capstone of the United States Geological Survey astronomic pier in the grounds of the State Normal School at Ellensburg, and marked "1577." The elevation of this tablet depends on mean sea level at Tacoma, as established by levels of the Northern Pacific Railway, and is based on the top of a rail in front of the depot at Ellensburg. The elevation of this central datum point from the above connection is accepted as 1,576.821 feet.

The leveling was done, under the general direction of Mr. G. E. Hyde, topographer, by Mr. H. K. Kalloch, levelman.

CLE ELUM, VIA NORTHERN PACIFIC RAILWAY, TO STAMPEDE.

	Feet.
Cle Elum; nail in east sill of water tank at	1,914
Cle Elum; top of milepost "Tacoma 102–Pasco 152," 1,200 feet west of....	1,915.9
Cle Elum, ¼ mile west of; top of south rail at road crossing to wagon bridge over Yakima River	1,924.2

	Feet.
Cle Elum, 2 miles west of; nail in top of stump 10 feet northeast of milepost "Tacoma 100–Pasco 154"	1,956.6
Cle Elum, 3 miles west of; spike in cribbing south of track near milepost "Tacoma 99–Pasco 155"	1,963.6
Cle Elum River; top of rail at west end of bridge over	1,983.4
Nelson, 2¼ miles east of; nail in top of stump 40 feet south of track, near milepost "Tacoma 98–Pasco 156"	1,982.5
Nelson, 1½ miles east of; nail in step of most easterly post of rail rack north of track and just east of milepost "Tacoma 97–Pasco 157"	2,003.1
Nelson, 1 mile east of; top of south rail at road crossing	2,015.3
Yakima River; bridge at sixth crossing, middle of five indentations at southwest corner of southwest masonry abutment ¾ mile east of Nelson	2,025.9
Nelson; 3 feet east of fence corner and 12 feet west of large pine tree, 205 feet south of track, 200 feet northeast of house of Peter Nelson and 410 feet southwest by west from signboard "Nelson;" iron post marked "2035"	2,035.436
Nelson, ½ mile west of; nail in stump 25 feet south of track, opposite milepost "Tacoma 95–Pasco 159"	2,041.8
Nelson, 1½ miles west of; spike in top of stump 15 feet north of track and 270 feet west of milepost "Tacoma 94–Pasco 160"	2,086.9
Trestle No. 151; top of north rail at center of, 1½ miles west of Nelson	2,080
Big Creek; top of rail, center of bridge over	2,107.6
Big Creek; 25 feet north of west pillar of signpost at siding, 35 feet north of main track, and 150 feet east of trestle No. 56 over small creek; iron post marked "2109"	2,108.738
Big Creek; top of north rail, center of trestle No. 155, just west of side track at station	2,107.8
Big Creek, ½ mile west of; nail in center of top of stump 15 feet north of track and 40 feet east of milepost "Tacoma 92–Pasco 162"	2,096.3
Big Creek, 1½ miles west of; nail in stump 12 feet south of track and 75 feet east of road crossing and milepost "Tacoma 91–Pasco 163"	2,109.5
Easton, 0.8 mile east of; nail in root of stump 30 feet south of track, 150 feet west of road crossing	2.133.9
Easton, 90 feet northwest of northwest corner of station, 110 feet north of track at water tank and 80 feet south of general store and post-office; iron post marked "2172"	2,171.688
Easton, 1 mile west of; nail in top of intersection of signboards on milepost "Tacoma 88–Pasco 166"	2,194.4
Easton, 2 miles west of; nail in top of milepost "Tacoma 87–Pasco 167"	2,209.1
Cabin Creek; top of rail, center of bridge over	2,229.4
Easton, 3 miles west of; railroad spike in side of milepost "Tacoma 86–Pasco 168"	2,250.7
Snoqualmie wagon-road crossing; nail in root of stump 20 feet north of old Northern Pacific, bench mark 3¾ miles west of Easton	2,311.31
Snoqualmie wagon road, at intersection with Northern Pacific Railway, 12 feet north of railroad track and 15 feet east of wagon road, 3¾ miles west of Easton; iron post marked "2310"	2,309.700
Easton, 4 miles west of; nail in side of milepost "Tacoma 85–Pasco 169"	2,356.3
Easton, 5 miles west of; nail in top of milepost "Tacoma 84–Pasco 170"	2,470.3
Martin, 2 miles east of; nail in log at west end of trestle No. 167	2,575.1
Martin, 1½ miles east of; top of nail at east end of trestle No. 169	2,614.3
Martin, 1 mile east of; nail in center of top of stump 6 feet northwest of mile post "Tacoma 82–Pasco 172"	2,677
Martin; top of south rail at center of station	2,780.4
Martin, on bank above track 40 feet east of station and 20 feet south of main track, 6 feet east of telegraph pole; iron post marked "2788"	2,787.676

	Feet.
Martin, just west of; bolt in east end of top of lateral timber of cribbing under milepost "Tacoma 81–Pasco 173"	2,785.3
Stampede Tunnel, at east end of; top of south rail at east end of snowshed	2,837.9
Stampede Tunnel, west end of; nail at base of upright timber north of track west end of snowshed	2,809.4
Stampede Tunnel, west end of; nail in log over small stream 12 feet south of track and 100 feet west of snowshed	2,803.5
Stampede Tunnel, 150 feet west of snowshed at west end of; nail in south end of transverse timber, second from top, east end of cribbing north of track	2,808.8
Stampede, 75 feet southwest of station and 10 feet northwest of bluff over Deer Creek; iron post marked "2781"	2,781.278
Stampede, ¼ mile west of; nail in stump 25 feet north of track on inside of curve, under bank of cut, and 300 feet west of milepost "Tacoma 78–Pasco 176"	2,753.8
Stampede, ¼ mile southwest of; nail in root of 3-foot fir tree on trail running between the two ends of Stampede loop, 6 feet northwest of trail near edge of wide gully into which the trail runs	2,627.4

EASTON TO KATCHESS LAKE ALONG WAGON ROAD.

Katchess Lake, about 1 mile south of; nail in root of tree near point where road first touches the Katchess River and makes a sharp turn	2,234.9
Katchess Lake; at end of road 45 feet west of old cabin built of square logs, 50 feet from edge of lake and 675 feet north of boathouse; iron post marked "2235"	2,234.557
Katchess Lake; surface of water September 6, 1897	2,226.1

MARTIN, VIA WAGON ROAD, TO SNOQUALMIE PASS.

Martin, ½ mile north of; nail in small stump west side of road, 100 feet from intersection of Martin road and road from Easton	2,528.3
Mosquito Creek Ford; surface of water at	2,459
Martin, about 2 miles north of; nail in root of hemlock south of road, tree blazed	2,478.5
Kitchelos Lake, south end of; nail in top of burnt stump 60 feet south of old sawmill site, 75 feet north of road, and 600 feet southwest of outlet of lake	2,473.3
Kitchelos Lake, at south end of; 40 feet north of wagon road, 120 feet south of old sawmill site at foot of lake, 500 feet southwest of ford at head of Yakima River; hemlock tree 3 feet in diameter, blazed on three sides, 20 feet south of bench mark; iron post marked "2479"	2,479.085
Kitchelos Lake, surface of, September 11, 1897	2,458
Kitchelos Lake, at head of; nail in root of dead fir tree 35 feet south of Denny Cabin	2,470.6
Rocky Run, 50 feet west of; nail in root of tamarack tree just north of road	2,596.1
Rocky Run, ¼ mile northwest of; nail in root of hemlock tree 1½ feet in diameter, in flat, blazed twice, 12 feet southwest of road	2,527.8
Gold Creek Ford, ½ mile southeast of; nail in root of large fir tree south of road; tree is 6 feet in diameter and across road from another large fir with blaze	2,516.9
Gold Creek trail, directly opposite and 6 feet south of road; small burn east of bench mark; iron post marked "2502"	2,502.302
Gold Creek Ford, ¼ mile northwest of; nail in root of hemlock 18 inches in diameter just south of road in flat	2,567.8
"Summit 2 miles," 50 feet east of tree blazed as above; nail in root of twin hemlock 10 feet northeast of road	2,734.6

Feet.

Summit, 1.7 miles southeast of; nail in root of cedar 6½ feet in diameter southwest of road 2,931.3

Summit, 1½ miles southeast of; nail in root of hemlock northeast of road near top of first hill 3,028.2

Summit, ¾ mile southeast of; nail in root of 5-foot hemlock southwest of road and 450 feet northwest of small creek crossing 2,933.8

Snoqualmie Pass, surface of small lake at, about 100 feet north of wagon road 3,004.3

Snoqualmie Pass, 8 feet south of road at summit and ¼ mile west of small lake in marsh north of road, four trees blazed as witnesses; iron post marked "3131" 3,131.073

Snoqualmie triangulation station; bronze tablet set in rock of west top of high mountain just northwest by north of Snoqualmie Pass, the first peak north of Guys Peak; elevation determined by vertical angles; bronze tablet marked "6386" 6,386

GOLD CREEK TRAIL.

Gold Creek trail, at head of; 40 feet west of cabin known as Denny Cabin; elevation determined by vertical angles; iron post marked "4489" 4,489

TAMARACK SPRINGS, VIA OLD INDIAN TRAIL, TO GREEN RIVER PASS.

Frost Creek, about 5 miles west of, where trail crosses, and 25 feet west of trail, about ¼ mile east of first summit reached after leaving the creek; elevation determined by vertical angles; iron post marked "5695" 5,695

Manastash Creek, at the head of South Fork of, on top of bunch-grass hill just south of divide; elevation determined by vertical angles; iron post marked "6207" 6,207

Manastash Creek, 2.5 miles west of divide at the head of South Fork of, just north of trail, on south side of bunch-grass hill; elevation determined by vertical angles; iron post marked "5704" 5,704

Manastash Creek, about 9 miles west of divide at the head of south fork of, on north side of trail; elevation determined by vertical angles; bronze tablet marked "5238" 5,238

Green River Pass, in lowest point of, first pass the trail goes through after reaching the crest of the Cascade Mountains; trail is obliterated at this point owing to recent burn; elevation determined by vertical angles; iron post marked "4894" 4,894

GOLD HILL TRAIL, RUNNING SOUTH FROM NATCHES PASS.

Natches Meadows, about 4½ miles south of, and about 500 feet north of trail; elevation determined by vertical angles; bronze tablet marked "5948" .. 5,948

BUCKLEY-YAKIMA TRAIL THROUGH NATCHES PASS.

Green Water River and Goat Creek, 1.63 miles north by northeast from the intersection of, and about 5.5 miles northwest by west of Natches Pass; elevation determined by vertical angles; bronze tablet marked "5099" 5,099

Natches Pass, at summit of, just north of trail; elevation determined by vertical angles; iron post marked "4928" 4,928

Natches Pass, about 8 miles east of, on south side of large meadow near north edge of timber burn, about ¼ mile southeast of where trail crosses Natches River three times within as many hundred feet; elevation determined by vertical angles; iron post marked "3119" 3,119

SNOHOMISH COUNTY.

SAUK AND STILLAGUAMISH QUADRANGLES.

The elevations in the following list are based on a copper bolt marked "2772" and set in a large rock east of the Everett and Monte Cristo Railway trestle at Monte Cristo, 247 feet north of freight platform and 20 feet right of switch back. The elevation of this bench mark depends on levels of the Everett and Monte Cristo Railway and is based on their bench mark described as "a nail in root of a large stump 26 inches in diameter, 15 feet north of center of track at station 19, Everett and Monte Cristo Railway." The elevation of this central datum point from the above connection is accepted as 2,772.472 feet.

The leveling was done under the general direction of Mr. L. C. Fletcher, topographer. Mr. G. H. Pratt did all of the leveling except two spur lines to Goat Lake and Divide Station, on Index Trail, which were done by Mr. John Graff, and two spurs to Lake Roesiger and Kelly's ranch, which were done by Mr. F. C. Graff.

MONTE CRISTO, VIA EVERETT AND MONTE CRISTO RAILWAY AND DOWN SAUK RIVER, TO GRANITE FALLS.

	Feet.
Monte Cristo station, 247 feet north of freight platform, 20 feet east of switch back in large rock north of Everett and Monte Cristo Railway trestle; copper bolt marked "2772"	2,772.472
Monte Cristo station, about 1,600 feet northwest of; on larch stump 15 feet east of station 19 on Everett and Monte Cristo Railway	2,723.13
Bridge No. 54 on Everett and Monte Cristo Railway, 210 feet west of; on hemlock stump 30 inches in diameter, 25 feet south of station 41	2,650.76
Switch back, middle leg of; 15 feet north of track and 135 feet west of switch stand on hemlock stump 36 inches in diameter	2,580.09
Bridge No. 51, 210 feet east of; on hemlock stump 30 inches in diameter 20 feet north of center of track	2,508.55
Station 2105+20 on railroad, about; 180 feet west of point of 4° curve to east; hemlock stump 20 feet north of center of track	2,411.98
Station 2080 on railroad, about; 100 feet east of point of 4° curve to west; on hemlock stump 20 feet north of center of track	2,354.44
Sauk River bridge, 60 feet west of west end of; on hemlock stump 26 inches in diameter and 30 feet south of center of track	2,300.52
Barlow Pass station, about ¼ mile east of; on hemlock stump with wide-spreading roots about 30 feet north of center of track	2,311.11
Barlow Pass station, 12 feet east of; on larch stump 30 inches in diameter 12 feet north of center of track	2,345.10
Barlow Pass, about 4,200 feet west of, near point of 5° curve left (station 1941 50) 15 feet south of center of track; on hemlock stump 24 inches in diameter	2,240.79
Milepost No. 36, 400 feet west of, 15 feet south of track; on hemlock stump 30 inches in diameter	2,202.28
Milepost No. 34, 350 feet west of; on hemlock stump 36 inches in diameter.	1,926.21
Bridge No. 42, Perry Creek, 120 feet west of, on south side of track; on hemlock stump 24 inches in diameter	1,746.73
Bridge No. 37, 25 feet east of west end of; on larch stump 36 inches in diameter	1,644.39

	Feet.
Bed of South Fork of Stillaguamish River, opposite bridge 37	1,628
Milepost No. 30, 670 feet west of, 15 feet south of track; on hemlock stump 4 feet in diameter	1,572.83
"Forty-five" Mining Company's ore house, 450 feet east of, 15 feet north of center of track; on cedar stump 5 feet in diameter	1,476.64
Silverton, 1,000 feet east of water tank, 210 feet east of milepost No. 29, 20 feet north of track; copper bolt in granite bowlder 6 by 6 by 6 feet marked "1521"	1,521.362
Milepost No. 28, about 1,800 feet west of, south side of track; on hemlock stump 36 inches in diameter	1,435.63
Milepost No. 27, about 1,850 feet west of, on north side of track; on hemlock 36 inches in diameter	1,383.68
Stillaguamish River, third crossing of, 210 feet west of bridge No. 30; on a spruce stump 4 feet in diameter, south of track	1,279.78
Boardman Creek, about 2,200 feet east of west end of bridge No. 29 over, in T. 30 N., R. 9 E., probably section 20, 40 feet south of railroad, on west end of ledge which rises up some 40 feet above track; bench mark is 4 feet higher than track; copper bolt marked "1247"	1,247.054
Mud Tunnel, 400 feet northwest of west end of; on hemlock 36 inches in diameter 20 feet west of track	1,177.62
Bridge No. 23, 120 feet west of; on hemlock stump 18 inches in diameter, south side of track	1,062.59
Bridge No. 19, 1,050 feet west of, north side of track; on hemlock stump 18 inches in diameter	944.44
Bridge No. 17, 250 feet west of, in T. 30 N., R. 8 E., about 400 feet east of section line between sections 7 and 8, 15 feet south of Everett and Monte Cristo track in a 6-foot cut; copper bolt in slate rock marked "897"	897.209
Bridge No. 15, 250 feet east of, 20 feet south of track; on hemlock stump 4 feet in diameter	865.54
In front of Mr. Cady's house, about ½ mile west of; milepost No. 14, 20 feet north of track, near head of canyon	850.5
Tunnel No. 5, top of rail at east portal of	786.0
Tunnel No. 4, top of south rail at east portal of	763.3
Tunnel No. 3, top of south rail at east portal of	743.8
Tunnel No. 2, top of tie at west portal of	620.2
Tunnel No. 2, 600 feet west of; on fir stump 24 inches in diameter north of track	604.14
Milepost No. 9, 20 feet west of, on opposite side of track from; in side of solid rock cut about the middle of 10° curve to the right, 10 feet south of center of track; copper bolt marked "460"	459.748
Blackman's spur, 470 feet west of head block at, 15 feet north of track; on hemlock stump 30 inches in diameter	438.90

BARLOW PASS DOWN SAUK RIVER TO VICINITY OF DARRINGTON.

Barlow Pass Station, about ¼ mile northeast of; 10 feet east of wagon road and 150 feet north of long puncheon incline on road on hemlock 10 inches in diameter	2,248.03
Barlow Pass Station, about ½ mile northeast of; on root of double hemlock 24 inches and 30 inches in diameter, 15 feet west of wagon road; at station 37+50, on Goat Lake Electric Line survey	2,219.01
Sauk River Bridge, 20 feet south of south end of; on larch stump 8 inches in diameter on east edge of road	2,160.72
Sauk River, junction of road from Barlow Pass with road along; on hemlock 28 inches in diameter	2,200.88
Sauk River, junction of road from Barlow Pass with road along, about 1,600 feet north of; on hemlock 20 inches in diameter on west edge of wagon road	2,190.95

	Feet.
County road milepost No. 29, about 800 feet south of; on hemlock 30 inches in diameter on west edge of road	2,154.40
County road milepost No. 29, about 1,100 feet north of; on hemlock 30 inches in diameter on west side of wagon road at a point where a creek 10 feet wide first touches road on east side	2,028.10
Monte Cristo Lake, 60 feet north of cabin near; on larch stump west edge of road	2,010.79
Monte Cristo Lake, on east side opposite middle of; on dead cedar tree 40 inches in diameter on east side of wagon road	1,982.4
Goat Lake wagon road, intersection with Sauk River road; on cedar 5 feet in diameter	1,952.24
Goat Lake wagon road, intersection with Sauk River road, about 1,800 feet north of; 150 feet south of old bridge site; on hemlock 24 inches in diameter on west side of road	1,808.54
Elliott Creek, about 200 feet north of mouth of; 80 feet north of bridge site; hemlock 36 inches in diameter on east side of road	1,697.10
Elliott Creek, about 750 feet north of mouth of; 150 feet north of narrow strip of bottom land near foot of rise in road; larch 20 inches in diameter 15 feet west of road	1,643.57
Elliott Creek, about 1 mile north of; west side of road top of steep hill sloping north; on hemlock 48 inches in diameter	1,576.82
Milepost No. 25, about 1 mile south of; 30 feet east of right bank of river; on cedar 36 inches in diameter 10 feet west of road	1,496.59
Milepost No. 25, about ½ mile south of; 5 feet west of road and 100 yards north of washout; cedar stump 8 inches in diameter	1,416.45
Milepost No. 25, 50 feet north of creek crossed by bridge about 12 feet above water; on alder 15 inches in diameter, 5 feet west of road	1,368.88
Milepost No. 25, about 3,200 feet north of; 150 feet north of creek crossing and 225 feet south of washout in road where new trail goes around clay bank; cedar snag 6 feet in diameter 5 feet east of road	1,278.95
Orient, at junction of north and south forks of Sauk River, about 140 feet southeast of meander corner on southwest bank of the north fork; meander corner is on section line between secs. 9 and 16, T. 30 N., R. 11 E.; copper bolt in granite bowlder 4 by 6 by 2½ feet above ground marked "1241"	1,241.461
Milepost No. 23, about 1,080 feet north of; about ½ of distance up the second hill of "pitch" after passing creek; on cedar 30 inches in diameter west side of road	1,191.48
Milepost No. 22, about 700 feet south of; 75 feet south of bridge across small creek on south side of clearing; on granite bowlder east side of road	1,159.66
Milepost No. 22, about 3,350 feet north of; 150 feet north of cabin between road and river; on hemlock 36 inches in diameter on east side of road	1,097.07
Milepost No. 21, about 20 feet north of; on cedar 36 inches in diameter west side of road	1,075.44
Secs. 29, 30, 31, and 32, T. 31 N., R. 11 E., on bearing tree for corner to; cedar 48 inches in diameter on west side of road	1,033.52
Pugh's ranch, 500 feet north of; cedar 5 feet in diameter on west side of road	1,021.19
Sec. 31, T. 31 N., R. 11 E., about 1,500 feet from corner to sections 29, 30, 31, and 32, left bank of Sauk River, 20 feet northeast of the pool at foot of fall on Falls Creek 150 feet above its mouth; copper bolt in ledge marked "1039"	1,038,542
Snover's cabin, about 660 feet north of; hemlock 30 inches in diameter on east of road	579.85
McClellan's ranch, 2,400 feet northwest of; cedar 5 feet in diameter 10 feet west of road	938.97

	Feet.
White Chuck River Bridge, 50 feet south of east abutment of; on hemlock stump 12 inches in diameter on east of road	936.99
Duber's cabin, 100 yards northwest of, T. 31 N., R. 10 E., about 220 feet southeast of meander corner on west bank of Sauk River, between sections 14 and 15; copper bolt in blue ledge 10 feet west of road marked "838"	837.983
Bordens Creek, 50 feet north of; hemlock 15 inches in diameter on west of road	813.30
Murphy's house, 900 feet west of; 150 feet west of top of hill; on fir stump 20 inches in diameter on south of road	830.11
Raucher's cabin, 600 feet north of, T. 31 N., R. 10 E., ¼ mile southeast of meander corner between sections 4 and 9; on cedar 18 inches in diameter on west of road	735.55
Meander corner, between sections 4 and 9, 300 feet north (along road) of, T. 31 N., R. 10 E.; on cedar 12 inches in diameter, on west of road, about 40 feet from river	708.93
Milepost No. 12, about 1,000 feet south of; 150 feet north of bench of land 20 feet higher than bench mark; on hemlock 30 inches in diameter on west of road	687.50
Milepost No. 11, about 1,800 feet southeast of; 100 feet north of short ascent 12 feet high to bench of land, 30 feet from river bank; on cottonwood 28 inches in diameter on west of road	659.97
Milepost No. 11, about 250 feet northwest of; 200 feet north (along road) of log cabin; on fir 24 inches in diameter on west of road	644.25
Clear Creek, about ¼ mile south of; 150 feet north of highest point in road over foot of mountain; on fir stump 4 feet in diameter on east of road	675.84
Clear Creek, 50 feet east of; at a point about 150 feet above its mouth, 50 feet south of a log cabin, in ledge on south of road; copper bolt marked "625"	624.822
Clear Creek, about 4,500 feet northwest of; about 1,200 feet (along road) north of first clearing north of Clear Creek; on cedar 30 inches in diameter on east of road	591.44
Milepost No. 8, about 1,500 feet north of; on fir 12 inches in diameter on west of road	573.73
Emmons's house, 100 feet northwest of; junction of road down Sauk River with road to Darrington post-office; on fir 18 inches in diameter	564.76
Stillaguamish River, junction of Sauk River road with road down; 58 feet west of Sauk River road and 20 feet south of Stillaguamish road; nail in fir tree 28 inches in diameter	554.73
Stillaguamish River, junction of Sauk River road with road down; ¼ mile west of; on cedar 8 inches in diameter on north of road	543.13

VICINITY OF DARRINGTON DOWN, NORTH FORK OF STILLAGUAMISH.

Milepost No. 6, 500 feet west of; 140 feet west of point where road makes a sharp turn to the west; on hemlock 15 inches in diameter	530.09
Corner to secs. 9, 10, 15, and 16, T. 32 N., R. 9 E., 40 feet west of; on dead fir 24 inches in diameter and 25 feet south of road	527.9
Darrington "barn," on west side of; sec. 9, T. 32 N., R. 9 E., 10 feet north of trail, halfway down the slope between bench and bottom land, slope faces south, a log barn on Squire Creek bottom bears SSE. about 600 feet distant; in granite bowlder 3½ by 2½ by 1 feet above ground; copper bolt marked "100"	496.009
James Smith's ranch, by bars across trail leading to; 150 feet west of Squire Creek; on cedar 8 inches in diameter	454.73
W[illegible]house's ranch, opposite gate entrance to; on cedar 36 inches in diameter	452.54

	Feet.
John A. Campbell's ranch, 50 feet east of trail going to; corner of secs. 7 and 18, R. 9 E., and secs. 12 and 13, R. 8 E., 470 feet west of; on cedar stump 24 inches in diameter on south side of trail	454.45
Secs. 12 and 13, T. 32 N., R. 8 E., 100 feet west of; ¼ corner between; on hemlock 20 inches in diameter on north side of trail	452.50
Secs. 11, 12, 13, and 14, T. 32 N., R. 9 E., 20 feet northwest of corner to; on cedar 18 inches in diameter, which is the northwest bearing tree of corner	464.91
Cavanaugh's trail, point of branching; on cedar stump 18 inches in diameter on north side of trail	427.54
Frenchs Creek, 250 feet west of; trail branching to north; on hemlock stump 14 inches in diameter on north side of trail	399.63
Boulder Creek, top of descent toward; 80 feet east of; on hemlock 14 inches in diameter on west edge of bench	410
Boulder Creek, 350 feet west of; on cedar stump 24 inches in diameter on north side of trail	330.28
Joe Pott's clearing, S. 8, T. 32 N., R. 8 E., on trail to, and about 700 or 800 feet southwest of cabin, about 2,000 feet northerly from main trail down Stillaguamish River, on south side of dry water course bearing east and west; copper bolt in rock 3½ by 2½ by 1½ feet above ground, marked "303"	303.176
Quarter section corner between secs. 7 and 8, T. 32 N., R. 8 E., 150 feet west of creek in ravine; on cedar 4 feet in diameter on south of trail	371.99
Milepost No. 1, 40 feet west of; on cedar 4 feet in diameter on north side of trail	369.64
Quarter section corner between secs. 11 and 12, T. 32 N., R. 7 E., about ¼ mile east on left bank of north fork of Stillaguamish River; on cedar 36 inches in diameter on south side of trail, top of low bluff	297.7
Quarter section corner between secs. 11 and 12, T. 32 N., R. 7 E., about 600 feet southeast of, 15 feet north of abandoned road which branches off from the new wagon road about 200 feet northeast, in slashing 30 feet north of steep descent to North Fork of Stillaguamish River, about 50 feet below, on north slope of rock 6½ feet long and 2½ feet wide, roof shaped; copper bolt, marked "286"	285.948

SILVERTON SOUTH (VIA TRAIL) OVER DIVIDE TO WILLIAMSON CREEK, THENCE DOWN SAME TO SULTAN RIVER.

"Forty-five" Mining Company's tram, 40 feet south of the fifth mast; on hemlock stump 36 inches in diameter, beside trail	1,875.55
"Forty-five" Mining Company's tram, 40 feet southwest of the ninth mast; on larch stump 24 inches in diameter, on trail	2,360.03
Solid rock, 50 feet below loop in trail cut out of, 50 feet below tram, 10 feet below trail; on hemlock stump 20 inches in diameter	3,028.94
Second loop in trail cut out of solid rock; on hemlock 20 inches in diameter, where trail begins to descend	3,375.82
Michigan Gulch, 25 yards south of tram, 10 feet north of trail; on larch 36 inches in diameter	3,571.92
Summit, ground at	4,173
Summit, 5 feet west of mast on tram; on larch stump 36 inches in diameter	4,175.57
Summit, about ¼ mile south of; on larch 30 inches in diameter on south side trail	3,513.09
Adelaide Gulch, near intersection of two small streams at; on hemlock 12 inches in diameter on south side of trail	3,017.63
"Forty-five" Mining Company's sawmill, 80 feet east of; on larch stump above skid road	2,581.47

	Feet.
Williamson Creek, intersection of trail with right bank of; on larch 24 inches in diameter	1,902.39
Log cabin, 850 feet south of, on east side of trail; on larch 36 inches in diameter	1,811.55
T. 29 N., R. 10 E., probably in section 7, 200 feet south of small creek in detached rock 10 by 10 by 5 feet; copper bolt marked "1688"	1,688.43
Sultan River, on north bank of, in T. 29 N., R. 9 E., 50 feet east of north end of bridge over same, 600 feet east of mouth of Williamson Creek; copper bolt in bed rock marked "1413"	1,412.834

GRANITE FALLS SOUTHEAST TO LAKE ROESIGER.

Granite Falls station, 350 feet west of, 40 feet south of track, on first ridge of solid land west of station; iron post marked "397"	396.550
Granite Falls, 1,200 feet east of; on 18-inch fir on right of road	396.87
Kerren's, across bridge opposite; 5-foot cedar stump, left of road	439.32
Whetmore's slashing, 1,000 feet south of; on root of cedar stump, right of road	510.62
James Whetmore's house, 900 feet southwest of; on tall dead snag, right of road	530.1
Swamp, 150 feet beyond bridge over; on 18-inch hemlock left of road	496.06
Menzels Lake, opposite middle of; on hemlock stump right of road	504.50
Henry Menzels's house; on 2-foot hemlock stump opposite, left of road	539.33
Chownding's, 1,250 feet north of, in clearing; on 18-inch hemlock left of road	460.55
Barstow's house, 40 feet north of, near trail cutting across to Lake Roesiger wagon road; on 18-inch hemlock stump	523.05
Barstow's house, 1,000 feet southeast of; on 3-foot hemlock left of trail	637.79
Roesiger Lake road, 800 feet south of house; on 12-inch hemlock left of road	732.24
Small Lake, forks of road at, 60 feet beyond; on 18-inch hemlock 10 feet left of road	714.08
Small Lake, 1,400 feet beyond, forks of road at; on 24-inch hemlock left of road	606.83
Evans's house, 900 feet northwest of; on 12-inch cedar stump left of road.	586.84
Lake Roesiger, 100 feet east of Nesbeth's barn, 150 feet left of trail; copper bolt in bowlder marked "619"	618.674
Lake Roesiger, surface of water	567

CHOWNDING'S TO KELLEY'S RANCH.

Chownding's, 1,500 feet beyond; on 24-inch hemlock left of road	485.50
Schoolhouse, 800 feet beyond; on 30-inch hemlock stump right of road	490.17
Russell's house, 500 feet west of; on 24-inch hemlock stump right of road.	503.70
Law's house, 1,200 feet west of; on 36-inch hemlock stump right of road.	548.67
Crow's house, 100 feet north of; on 36-inch hemlock stump in Crow's field.	561
Summit of Divide, on 5-foot cedar snag on right of trail	739.07
Feemster's house, 200 feet northwest of; on 5-foot cedar left of trail	638.58
Kelley's, 1,200 feet west of; on 36-inch cedar near creek right of trail	663.68
Kelley's house, 1,250 feet east of; on 18-inch hemlock 15 feet left of trail.	707.18
Kelley's house, 1,750 feet east of; on bowlder on side hill 25 feet left of trail and 275 feet from Pitchuck River; copper bolt marked "746"	746.244

MONTE CRISTO AND INDEX TRAIL TO TOP OF DIVIDE.

Summit of Divide, 3 feet north of trail at summit, 20 feet west of rock cliff, and 20 feet northeast of 40-inch dead fir; copper bolt in rock marked "4866"	4,865.726
Summit of Divide; 8-penny nail in dead fir tree 40 inches in diameter, 18 feet west of trail	4,849

GOAT LAKE LINE.

	Feet.
Elliott Creek, bed of, at road crossing	1,795
Goat Lake, 61 feet north of Coffin's log house, 12 feet northeast of Goat Lake road, and about 60 feet northeast of Elliott Creek; copper bolt in rock in place marked "3162"	3,163.978
Goat Lake, surface of water	3,154

OREGON.

COOS AND CURRY COUNTIES.

PORT ORFORD AND COOS BAY QUADRANGLES.

The elevations in this list are based on a bronze tablet in the north wall of Hermann & Brown's brick building, corner of Spruce and Front streets, 30 feet from northwest corner of building and 2 feet above the surface of ground in Myrtle Point, Coos County, Oregon, the height of which is accepted as 75.916 feet above mean sea level. This elevation was obtained from levels carried from a bench mark of the United States Coast and Geodetic Survey at Empire City the previous field season. (See Eighteenth Annual Report, Part I, p. 400.

The leveling was done under the general direction of Mr. A. E. Murlin, topographer, by Mr. C. C. Ward, levelman.

MYRTLE POINT TO ETELKA POST-OFFICE, VIA CRIBBINS HILL AND SOUTH FORK OF COQUILLE RIVER.

	Feet.
Residence of Eugene Phelps, 190 feet southeast of; head of nail in top of west prong of a 3-pronged myrtle stump, 2 feet in diameter, 3 feet high, on east side of road	35.40
Reeds Ford; head of nail in myrtle tree, in a clump of myrtle and maple trees at the forks of road on south bank of river, northeast of residence of Ernest Hermann	37.22
Cribbins Hill, north foot of; head of nail in partially decayed stump 1 foot in diameter in middle of road	42.05
Cribbins Hill, top of; in center of small triangle of forks of road; iron post, marked "240"	240.008
Garter's cabin, opposite and 190 feet south of small barn; 1 mile south of Cribbins Hill; head of nail in top of cedar stump 3 feet in diameter and 3 feet high in small meadow west side of road	216.75
Cribbins Hill, foot of, on south side; head of nail in cedar stump in forks of road	120.43
Emanuel Hermann's residence, at forks of road south of; head of nail in alder tree 40 feet west of road and south side of small branch crossing same	75.42
Forks of road to Eckley, in southeast angle of same and 390 feet south of a schoolhouse; top of iron harrow tooth, 11 inches long, driven in ground 4 inches below the surface, 1 foot north of signboard post	142.97
Russell Dement's residence, 29 feet east of entrance to; 1,000 feet south of forks of road to Eckley and Etelka, in southeast ¼ of S. 6, T. 30 S., R. 12 W.; iron post marked "113"	113.013
Johnson's ranch; head of nail in fir tree 18 inches in diameter, on west side of road, at south end of lane through and opposite mouth of Dement Creek, in S. 8, T. 30 S., R. 12 E	152.21

	Feet.
Massey's house; head of nail in cedar stump 3 feet in diameter and 3 feet high, on west edge of road, in small bend just south of, on line between secs. 16 and 17, T. 30 S., R. 12 W	91.17
Leaning myrtle tree, 2 feet in dimeter, one of a clump of myrtles, one of which is marked "11 M.B.T.," on west side of road and 30 feet from river; head of nail in	93.23
Etelka post-office; head of nail in cedar hub driven in ground 4 inches below the surface at foot of south gatepost on west side of road at Etelka post-office, on ranch of R. P. Carman, S. 22, T. 30 S., R. 12 W	123.95
Etelka post-office; 20 feet west of entrance to residence of R. P. Carman, north line of S. 22, T. 30 S., R. 12 W., and 120 feet east of wagon road; iron post marked "143"	143.062
ETELKA POST-OFFICE UP SOUTH FORK OF COQUILLE TO MOUTH OF SALMON CREEK.	
Rowland Prairie schoolhouse; head of nail in myrtle tree 18 inches in diameter, 250 feet east of and 300 feet south of ford, east edge of road and north line of S. 27, T. 30 S., R. 12 W	102.74
W. A. Warner's ranch; head of nail in myrtle tree 16 inches in diameter, on south side of road and 500 feet west of river, at ford, between secs. 27 and 34, T. 30 S., R. 12 W	122.91
John Warner's cabin, ¼ mile northwest of; head of nail in fir tree 4 feet in diameter, on east side of road and north end of prairie, in sec. 34, T. 30 S., R. 12 W	187.71
John Warner's cabin, 14 feet west of southwest corner of, in small prairie in southwest quarter of sec. 34, T. 30 S., R. 12 W.; iron post marked "204"	204.027
Sec. 3, T. 31 S., R. 12 W., near summit of hill in northeast quarter of; head of nail in fir tree 5 feet in diameter on north side of road	315.81
Guy Holcomb's place; head of nail in east side of hemlock tree 2 feet in diameter on east side of road, on top of hill north of small prairie in sec. 3, T. 31 S., R. 12 W	262.31
Hood's prairie, in west end of, near line between secs. 10 and 11, T. 31 S., R. 12 W.; head of nail in apple tree on west side of road and 75 feet east of river	173.08
Gant's prairie, west side of sec. 12, T. 31 S., R. 13 W.; bench cut in ledge of sandstone rock on west side of road and on south bank of Woodwards Creek at its mouth	193.95
Mouth of Woodwards Creek, south bank of; east side of wagon road in north face of sandstone ledge 1.6 feet above bed of creek and 3.8 feet below top of ledge; bronze tablet marked "194"	193.947
John Wagner's residence, about 100 feet south of; in sec. 13, T. 31 S., R. 13 W.; head of nail in top of cedar stump 3 feet in diameter and 3 feet high	274.14
MOUTH OF SALMON CREEK, UP SAME TO GREEN'S PRAIRIE.	
Wagner's deer stand, point of ridge known as; head of nail in top of alder stump 4 inches in diameter and 18 inches high in clump of alder trees	275.79
Slide, upper end of; bench mark cut in top of small ledge on east bank of main creek and north bank of small creek at junction, in sec. 34, T. 31 S., R. 12 W	491.3
Sec. 34, T. 31 S., R. 12 W., small ledge of rock on east bank of main creek and north bank of small creek about 3 feet above bed; bronze tablet marked "489"	489.122
Walker's cabin, 20 feet north of, above Salmon Creek Lake; head of nail in top of stump 10 inches in diameter at surface of ground, by the side of forked dead maple tree in gravel bank in creek	517.06

	Feet.
Rigg's ranch, sec. 4, T. 32 S., R. 12 W.; head of nail in leaning maple tree 18 inches in diameter between trail and creek	623.97
Tims Creek, at mouth of; head of nail in fir tree 5 feet in diameter on north bank of main creek, at crossing of Johnson Mountain trail, in sec. 8, T. 32 S., R. 12 W	710.01
Secs. 5, 6, 7, and 8, T. 32 S., R. 12 W., 410 feet west of corner of; head of nail in oak tree 24 inches in diameter on Tims Creek	846.27
Ed Green's residence, called Deer Park, on Tims Creek, northeast corner of yard in front of; northwest ¼ of sec. 8, T. 32 S., R. 12 W.; iron post marked "821"	820.842

GREEN'S PRAIRIE TO ECKLEY POST-OFFICE.

Sec. 6, T. 32 S., R. 12 W., 2 miles south of Eckley post-office; head of nail in madrone stump 3½ feet in diameter, 4 feet high, and 50 feet east of road on top of open ridge in	717.62
G. H. Guerin's residence, in front of; head of nail in top of cedar stump 14 inches in diameter, 4 feet high, on east side of road at north end of bridge across a small stream, sec. 31, T. 31 S., R. 12 W	483.49
Joe Haines's ranch, forks of road at; head of nail in fir tree 2 feet in diameter	462.30
Eckley post-office, Joe Haines's residence, 420 feet southeast of; in south face of ledge of rock in forks of creek, 2 feet above ground, 50 feet east of wagon road, on south bank of the North Fork of creek, 310 feet east of forks of road, sec. 36, T. 31 S., R. 13 W.; bronze tablet marked "441".	440.924

ECKLEY POST-OFFICE, DOWN SIXS RIVER TO BRIDGE ACROSS SAME.

Clark's ranch; head of nail in fir tree 2½ feet in diameter on east side of road at north side of clearing, sec. 1, T. 32 S., R. 13 W	417.39
Clark's house, southwest of; head of nail in tan bark oak tree 14 inches in diameter, on north side of road, about 1,050 feet west of crossing of small creek, near line between secs. 2 and 11, T. 32 S., R. 13 W	431.80
Avery's barn, about 300 feet in westerly direction from; head of nail in hollow cedar stump 3½ feet high, 4 feet in diameter, on ridge and 300 feet south of Eckley-Port Orford trail, sec. 10, T. 32 S., R. 13 W	379.50
Avery's residence, 90 feet southwest from west entrance to; near the line between secs. 10 and 11, T. 32 S., R. 13 W.; iron post marked "364"	364.158
Avery's, about ½ mile below; head of nail in fir tree 4 feet in diameter on south side of Eckley-Port Orford trail, near forks of	416.17
Pilot Knob, on south side of, 1½ miles west of Avery's; head of nail in tan bark oak tree 1 foot in diameter, on south side of Eckley-Port Orford trail, on point of open ridge covered with oak and madrone trees	451.41
Big Creek, at west end of bridge across; head of nail in fir tree on south side of Eckley-Port Orford trail and 50 feet east of forks of trail	280.95
Eckley-Port Orford trail, on south side of, about 4 miles below Avery's; head of nail in tan bark oak tree 8 inches in diameter on a steep hillside west from an open ridge which terminates in a rock bluff forming the north wall of the river gorge	319.10
South Fork of Sixs River, opposite mouth of; head of nail in tan bark oak 1 foot in diameter on north side of Eckley-Port Orford trail, on bank of ditch on point of ridge immediately east of small creek	304.06
Elephant Rock Creek, on west bank of, near its mouth, 10 feet west of cabin; head of nail in tan bark oak tree 18 inches in diameter, 3 feet high, on south side of Eckley-Port Orford trail	203.60
Dr. Elgin's cabin, 75 feet west of, inside of yard; head of nail in cedar stump 2 feet in diameter, 2½ feet high, 20 feet south of Eckley-Port Orford trail and 90 feet west of Lowe Creek 200 feet north of its mouth	196.77

	Feet.
Dr. Elgin's cabin, large bowlder 20 feet in diameter in dooryard of, 63 feet northeast from house, on west bank of Lowe Creek near its junction; copper bolt marked "196"	195.998
Corbin's placer mine; head of nail in leaning myrtle tree 18 inches in diameter on east bank of small creek emptying into river on north side 50 feet above its mouth	107.99
Corbin mine, below; head of nail in leaning ash tree 1 foot in diameter on north bank of river opposite mouth of wide canyon	92.83
St. Claire placer mine, opposite west end of; head of nail in leaning alder tree 7 inches in diameter on gravel bar at base of cleared hill on south side of river	84.44
Knapp's ranch, near house on; head of nail in leaning ash tree 76 inches in diameter on right bank of Little Dry Creek at its mouth	81.30
J. H. Divilbliss's ranch, entrance to; head of nail in myrtle tree 18 inches in diameter at gate on west side of road nearly opposite mouth of Big Dry Creek	73
J. H. Divilbliss's residence, 129 feet from the southeast corner of, in corner of yard 2.3 feet from south and east fences; iron post marked "88".	87.925
Edson Creek, 75 feet east of mouth of; head of nail in alder tree 2 feet in diameter on north bank of river	52.47
Allen's ranch, west side of; head of nail in forked ash tree 18 inches in diameter, at west end of gravel bar, 1 mile below mouth of Edson Creek.	51.515
Sixs River schoolhouse, about 250 feet south of; head of nail in leaning maple tree 3 feet in diameter, on north side of river and wagon road, opposite mouth of Beaver Creek	47.292
Sixs River, bridge across, east side of north end of; head of nail in two-forked maple tree each 1 foot in diameter, on main road Langlois to Port Orford	28.58
Sixs River, bridge across, in ledge of rock at south end of, on main road Langlois to Port Orford; copper bolt marked "U. S. G. S. 46"	45.893

SIXS RIVER BRIDGE, VIA DENMARK TO LANGLOIS.

Sec. 4, T. 32 S., R. 15 W.; head of nail in fir 3½ feet in diameter on east side of road on top of hill 1 mile north of bridge	167.25
Black Lock Point, 140 feet north of forks of road to, near line between secs. 32 and 33, T. 31 S., R. 15 W.; head of nail in black pine tree 1 foot in diameter, east side of road, 3 miles north of bridge	167.86
Sec. 28, T. 31 S., R. 15 W.; head of nail in fir tree 3 feet in diameter, 140 feet south of road, 4 miles north of Sixs River bridge; bearing tree marked "9 M. XXI"	144.53
Brushy and Boulder creeks, 230 feet north of forks of road to east and between; head of nail in white cedar stump 22 inches in diameter and 2½ feet high, west side of road, 5 miles north of Sixs River bridge	125.93
Denmark post-office; head of nail in alder tree 18 inches in diameter at the intersection of Second and Manning streets in the town site of Cleveland, 88 feet south of bridge across Willow Creek	98.22
Denmark post-office, 2 feet east and north of the intersection of Second and Manning streets in town site of Cleveland, 116 feet north of bridge over Willow Creek, sec. 15, T. 31 S., R. 15 W.; iron post marked "98"	98.114
Conyer's ranch, ¼ mile north of; head of nail in fir tree on east side of road on top of hill on south side of small creek, sec. 10, T. 31 S., R. 15 W.	133.97
Floras Creek, 30 feet north of north end of bridge over; head of nail in crooked maple tree 16 inches in diameter, on west side of road, 1 mile south of Langlois post-office, in sec. 3, T. 31 S., R. 15 W	42.48

	Feet.
F. M. Langlois's store, northeast corner of; iron bolt ¾ inch in diameter, 1 foot long, set in ground 4 inches, lot 4, block 1, town of Dairyville (Langlois post-office)	84.29
Langlois post-office, 3 feet north of Second and 3 feet east of Front street, in southwest corner of yard of Laurel Inn, Dairyville, south line of sec. 35, T. 30 S., R. 15 W.; iron post marked "89"	89.068

LANGLOIS TO BENNETTS BUTTE.

Walker's ranch, 675 feet up road from west entrance to; head of nail in fir stump 6 inches in diameter, 1 foot high, 4 feet east of wagon road, in sec. 35, T. 30 S., R. 15 W	642.13
Sec. 36, T. 30 S., R. 15 W.; head of nail in fir stump 2½ feet in diameter, 7 feet high, on northeast side of road	934.50
Joe Wendle's cabin, ¼ mile west of; head of nail in fir tree 28 inches in diameter, 12 feet east of road, sec. 31, T. 30 S., R. 14 W	1,109.58
E. H. Cheever's ranch, 100 feet west of gate to; head of nail in fir tree (gatepost) 18 inches in diameter, on north edge of road, west line of sec. 32, T. 30 S., R. 14 W	1,252.59
Joe Hare's cabin, at a hitching post 27 feet north of, in forks of road to Clark & Dwyer's; head of nail in cedar hub driven in ground 4 inches, in sec. 28, T. 30 S., R. 14 W	1,340.85
Bandon, on east side of road at the forks of road to; head of nail in white fir tree 18 inches in diameter, to which is nailed a letter box, sec. 28, T. 30 S., R. 14 W	1,318.78
W. W. Smith's barn, 520 feet south of, northeast side of forks of road to Bandon, 30 feet east of last bench mark, sec. 28, T. 30 S., R. 14 W.; iron post marked "1315"	1,315.003
Secs. 27 and 28, T. 30 S., R. 14 W., near line between; head of nail in tall fir stub 7 feet in diameter, north side of road, 220 feet east of sharp bend in road in head of draw	1,085.94
Steve Gallier's house, 115 feet east of gate in front of; head of nail in fir stub 5 feet in diameter, on north side of road, north side of sec. 27, T. 30 S., R. 14 W	600,92
Floras Creek, 15 feet south of east end of bridge across; head of nail in 4-pronged alder tree 3 feet in diameter, about the line between secs. 22 and 27, T. 30 S., R. 14 W	490.41
Rogers's house, in forks of road to; head of nail in decayed fir stub 4 feet in diameter and 50 feet high, sec. 26, T. 30 S., R. 14 W	558.1
Rogers's homestead cabin, 50 feet northeast of; head of nail in fir stump 3 feet in diameter, 3 feet high, 10 feet south of road, in northeast quarter of sec. 26, T. 30 S., R. 14 W	503.38
James Rogers's cabin, 6 feet north of, in front dooryard, on east side of road and south side of branch near its mouth, and at forks of trail up east branch of Floras Creek, sec. 26, T. 30 S., R. 14 W.; iron post marked "503"	502.96
Rogers's cabin, 1 mile east of; head of nail in dead fir tree 3½ feet in diameter 10 feet north of road	1,040.01
James Cotton's ranch; head of nail in fir stub 3 feet in diameter 4 feet high, south side of road and 3 feet south of road post on county line between Curry and Coos counties, sec. 24, T. 30 S., R. 14 W	1,461.51
Perry's private road, at its junction with main road and 50 feet north of main road; head of nail in fir stub 2 feet in diameter and 40 feet high, sec. 19, T. 30 S., R. 13 W	1,768.40

	Feet.
Bennetts Butte (Watches triangulation station), at forks of road to, on south side of road, sec. 20, T. 30 S., R. 13 W.; head of nail in fir tree 2 feet in diameter to which a letter box is nailed	1,901.17
Bennetts Butte (Watches triangulation station), in a small triangle at forks of road to, on crest of mountain and on county line in sec. 20, T. 30 S., R. 13 W.; iron post marked "1903"	1,903.252
Bennetts Butte (Watches triangulation station), summit of; on head of nail in cedar hub driven firmly into the ground 5 inches below the surface and 2 feet south of the stone triangulation mark	2,184.9

BENNETTS BUTTE, VIA CATCHING CREEK, TO CRIBBINS HILL.

Floras Creek, on point of open ridge south of the head of north fork of; head of nail in fir stub 6 feet in diameter, 20 feet west of road, sec. 20, T. 30 S., R. 13 W	1,812.58
Alder Springs camp ground, on west side of road at; head of nail in alder stump 10 inches in diameter and 3 feet high, sec. 17, T. 30 S., R. 13 W	1,493.37
Johnson's ranch, about ¼ mile west of road leading to; head of nail in fir stub 2 feet in diameter, at base of large sandstone bowlder on south side of road, sec. 17, T. 30 S., R. 13 W	1,058.35
Secs. 9 and 10, T. 30 S., R. 13 W., near line between; head of nail in fir tree 4 feet in diameter, 1 mile from foot of slope, south side of road, in sharp bend of road at foot of steep slope	798.98
Bennetts Butte, foot of east slope to, 475 feet west of house, in southeast quarter of sec. 3, T. 30 S., R. 13 W.; head of nail in fir stump 26 inches in diameter, 3 feet high, on west edge of road, 75 feet north of forks of road up South Fork of Catching Creek	190.77
Catching Creek, South Fork of; 100 yards west of bridge across; 14 feet northwest of and in dooryard of house, south side of road, near northeast corner of sec. 10, T. 30 S., R. 13 W.; iron post marked "177"	177.002
Duke's cabin, 20 feet east of; head of nail in fir stump 4½ feet in diameter and 3 feet high, 30 feet west of road, near line between secs. 2 and 3, T. 30 S., R. 13 W	195.64
Elliott post-office (abandoned), 30 feet south of residence of Joseph Knight; head of nail in white fir tree 28 inches in diameter	136.67
Allen's residence, 100 feet south of; head of nail in elderberry tree 10 inches in diameter on west edge of road	102.7
Smith's ranch, about 3500 feet westerly from Catching Creek bridge at; head of nail driven in soft sandstone bowlder 2½ by 5 by 7 feet above ground 10 feet west of road	58.35
Cribbins Hill, near summit; head of nail in bench cut in stump 150 feet south of forks of road	238.97

MOUTH OF SALMON CREEK, UP SOUTH FORK OF COQUILLE RIVER, VIA RURAL POST-OFFICE, TO LOWER END OF CANYON.

John Wagner's residence, 100 feet south of; head of nail in cedar stump 3 feet in diameter and 3 feet high, in sec. 13, T. 31 S., R. 13 W	274.14
Rural schoolhouse, 40 feet south of; head of nail in myrtle tree, 50 feet west and 350 feet south of section corner 18, 19, T. 31 S., R. 11 W. and 13, 24, T. 31 S., R. 12 W	290.97
Rural schoolhouse, 350 feet north and 40 feet west of; at section corner 18, 19, T. 31 S., R. 11 W. and 13, 24, T. 31 S., R. 12 W.; iron post marked "1902"	292.017
Sec. 30, T. 31 S., R. 11 W., near north line of; head of nail in two-forked alder tree, each 12 inches in diameter, east bank of river, about 1 mile south of rural schoolhouse	252.41

	Feet.
MacArnold's residence, in front of; head of nail in myrtle stump 3½ feet in diameter, 4 feet high, on south bank of river, opposite mouth of Banner Creek, sec. 30, T. 31 S., R. 11 W	271.96
John Hayes's ranch; head of nail in myrtle tree 12 inches in diameter, on east bank of river, opposite a slide of rock from Sand Rock Mountain, sec. 30, T. 31 S., R. 11 W	277.58
Stevenson's ranch, head of nail in smaller of two-forked myrtle stump 12 inches in diameter, on southwest bank of river, midway between mouth of Upper and Lower Lands creeks, sec. 31, T. 31 S., R. 11 W	292.46
Miner's cabin, 650 feet east of; bench mark cut in top of sandstone ledge on north bank of river at south end of canyon, at end of trail on north bank of river, sec. 5, T. 32 S., R. 11 W.; copper plug 5 feet from end of ledge and 5 feet above bed of river marked "319"	318.930

FROM MYRTLE POINT AND LANGLOIS ROAD DOWN FLORAS CREEK TO CLARK AND DWYERS ROAD.

Rogers's ranch, in forks of road to; head of nail in decayed fir stub 4 feet in diameter and 50 feet high	558.09
Floras Creek, at ford at road crossing of Clark and Dwyers road; head of nail in cedar stump 3 feet in diameter, 3 feet high, and 10 feet north of road, on west bank of creek, 2 miles south of Rogers's residence, sec. 2, T. 31 S., R. 14 W	403.44
Floras Creek, 37 feet west of, at ford at road crossing of Clark and Dwyers road, 90 feet east of a ledge of broken rock, sec. 2, T. 31 S., R. 14 W.; iron post marked "404"	404

CALIFORNIA.

LOS ANGELES, SAN BERNARDINO, AND RIVERSIDE COUNTIES.

SAN PEDRO, REDONDO, LOS ANGELES, POMONA, CUCAMONGA, SAN BERNARDINO, RIVERSIDE, SAN JACINTO, SAN FERNANDO, AND TUJUNGA QUADRANGLES.

The elevations in the following list are based upon a bench mark at San Pedro established by the United States Coast and Geodetic Survey, and described as "a horizontal line cut in the end of a half-inch brass bolt leaded into the side wall to the substantial brick storehouse belonging to and occupied by S. Phillips, ship chandler, San Pedro, California." This building is now occupied by J. A. Weldt, and is at the corner of Sixth and Front streets. The bolt is in the eighteenth course above the doorsill above the side entrance to the building and in the fifth brick from the side of the door next the ocean. The elevation of this bench mark above mean sea level was determined to be 18.54 feet.

The leveling from San Pedro to Colton, including side lines from the latter place to Riverside and San Bernardino; from Los Angeles to Santa Monica; from Los Angeles to San Fernando; from Los Angeles to Santa Monica, and in the Fernando and Tujunga quadrangles, was done by Mr. H. S. Crowe, and that from Colton to Seven Palms and in the Riverside and San Jacinto quadrangles by Mr. George H. Herrold.

SAN PEDRO TO LOS ANGELES ALONG SOUTHERN PACIFIC COMPANY'S TRACKS.

	Feet.
San Pedro; smooth place on projecting rock at brick wall of bank building.	22.34
Trestle 504-D; nail on cap of northeast bulkhead bent of, about 1¼ miles north of San Pedro	4.76
Trestle 503-D; spike in cap of northeast bulkhead bent of, ¼ mile south of Wilmington and 2 miles north of San Pedro	5.03
Wilmington; 152 feet to northeast corner of railroad water tank and 153 feet to southwest corner of depot; iron post marked "7"	6.515
Thenard Junction; about 100 feet west of station sign and 1 foot from telegraph pole; iron post marked "33"	32.607
Trestle 500-A; on railroad spike in cap of southwest corner of bulkhead bent of, about 1¼ miles west of Thenard Junction	20.72
Trestle 498-C; on railroad spike in cap of bulkhead bent in southwest corner of, about ¼ of a mile south of Cerritos station	28.35
Cerritos; corner of Dominquez and Railroad avenues, 1 foot from corner fence of railroad right of way and 96 feet from southwest corner of railroad building; iron post marked "32"	31.503
Dominguez, California; about 60 feet north of station; on railroad spike in bulkhead cap on southeast corner of trestle 496-A	55
Compton; 1 foot from fence in front of railroad depot, 88 feet from northeast corner of depot building and 30 feet from north post of gate to R. Barker's residence fronting depot; iron post marked "67"	66.638
Trestle 493-B; on spike in bulkhead cap on northwest end of, about 1¼ miles north of Compton	74.46
Florence; between depot building and small outhouse, 39 feet from southwest corner of depot building and 5 feet from large palm tree; iron post marked "136"	135.652
Florence post-office; at J. H. Ducher's store, wire nail in platform of public scales, 6 inches south from standard of scales	154.58
Vernondale; about 1 mile south of, and ¼ mile south of crossing of Southern Pacific Railroad and Southern California Railroad, on eucalyptus stump 20 inches in diameter and near track	177.26

LOS ANGELES.

Southwest corner of Seventh and Alameda streets, on top of fire plug	246.86
Arcade depot; 3 inches north of center post of northwest tower of; copper plug set in asphaltum marked "256"	255.679
Post-office building; in north stone buttress of main entrance to, on Main street, between Winston and Fifth streets; bronze tablet marked "270"	270.119
City Hall building; on Broadway, about 3 feet above the northern steps to front entrance; bronze tablet marked "286"	286.133
County courthouse; in granite buttress of, right hand of main steps to building, which is at southeast corner of Broadway and Temple streets; bronze tablet marked "338"	338.023

LOS ANGELES TO COLTON, ALONG SOUTHERN PACIFIC COMPANY'S TRACK.

Naud Junction; in concrete in floor of waiting room, alley at, 4 inches from side of baggage room and 8 inches from edge of concrete nearest railroad track; copper bolt marked "282"	282.233
Los Angeles River; southwest corner of railroad bridge at, in concrete pier; copper bolt marked "294"	294.090
East Lake Inn; in concrete, at top of foundation of, on northeast corner of Eastlake avenue and Mission road, on south side of building and 1.2 feet from steps; bronze tablet marked "333"	332.891

	Feet.
Aurant station, about ¼ mile west of, in top step of brick culvert on west side of railroad; copper bolt marked "399"	398.726
Shorb station; on south side of railroad yard at, 99.5 feet southeast from corner of depot and 55 feet west of signal-tower building; iron post marked "464"	463.825
Alhambra station; in west corner of railroad park at; iron post marked "456"	456.047
Trestle 490-B, nail in cap of northeast bulkhead of; about ¼ mile east of Alhambra station	415.13
San Gabriel; 85.6 feet from northeast corner of depot building, 94.9 feet from northwest corner of depot building and 7.1 feet west from post on which is a rain gage; iron post marked "415"	415.493
Savannah; 1 foot from fence south of depot and 75.9 feet from southeast corner of depot; iron post marked "300"	300.160
Savannah; in Western Union Telegraph pole, 73.3 feet north of depot; bronze tablet marked "292"	291.916
Bassett, ¼ mile west of; on railroad spike north side of east bulkhead of bridge	287.43
Bassett; south of depot, 86.7 feet from west end of platform to and 107.7 feet from southwest corner of depot; iron post marked "295"	295.040
Trestle 500-C; on first bolt on outside stringer west end of and north side of trestle, about 1 mile west of Puente station	304.43
Puente; 18 feet west of turnstile in fence north of depot and 125 feet north of east end of platform; iron post marked "331"	331.245
Puente warehouse; 1.4 feet from northwest corner of and 1.2 feet below brick foundation of; bronze tablet marked "331"	331.245
Trestle 504-B; nail in cap on northeast bulkhead of	394.40
Trestle 505-A; railroad spike in cap on northeast side of east end of, 2¼ miles west of Lemon station	433.42
Lemon station; 1 mile west of, on nail in plug 1 foot from fence on north of track	489.80
Trestle 507-B; on railroad spike in cap of east bulkhead bent, on northeast corner of, about ¼ mile west of Lemon station	513.88
Lemon station; in southeast corner of fence of railroad reservation and 113.2 feet from southwest corner of depot; iron post marked "519"	519.379
Trestle 508-E; bridge over Spadra Creek; on north side of west bulkhead of, on bolt in cap, about 1 mile east of Lemon	571.38
Trestle 509-C; railroad spike in cap on northeast side of east bent of	616.48
Trestle 510-A; on bolt on northwest bulkhead cap of, opposite milepost 510 and about 1½ miles west of Spadra	637.70
Spadra; 122.4 feet from northwest corner of depot; iron post marked "711".	711.398
Cattle guard 513-B; spike in west post of northwest corner of, about 1¼ miles west of Pomona	819.94
Pomona; 55 feet from depot near telegraph pole near park hedge; iron post marked "861"	861.138
Pomona; in Odd Fellows building, corner Second and Ellen streets, on Ellen street side, 11.6 feet from Second street corner, in third course from window and 8½ courses from sidewalk; bronze tablet marked "854"	854.469
Pomona; J. H. Graber building, corner railroad reservation and Gordon street, northwest corner of Gordon street, four rows from corner, seven courses from sidewalk; bronze tablet marked "861"	861.392
Pomona Junction; railroad bench mark on block near telegraph pole opposite, near northwest corner First and Reservoir streets	883.49
Trestle C; on spike in cap of northeast bulkhead of, near milepost 517 and 300 feet east of county line between Los Angeles County and San Bernardino County	908.74

	Feet.
Trestle 517-E; on railroad spike in cap of northeast bulkhead bent on...	928.76
Ontario; in grass plat in front of depot, 79.2 feet south of southwest corner of depot; iron post marked "986"	985.675
Ontario; in southwest corner of Southern Pacific Hotel, seventh course from sidewalk and two courses from doorway on west side of building; bronze tablet marked "992"	991.615
Ontario; in northwest corner of bank building situated on the corner of Main and ——— avenues, second course from steps, eight courses above sidewalk; bronze tablet marked "987"	987.130
Cattle guard 522-B; on nail in bulkhead plank on northeast corner of; about 1¼ miles east of Ontario	971.25
Trestle 523-B; bolt on cap of bulkhead near 523½-mile post	949.93
Trestle 524-A; on railroad spike in cap of east bent on northeast bulkhead bent of, ¼ mile west of Cucamonga	951.37
Cucamonga; in depot park at, 45.1 feet from southeast corner of depot and 2.6 feet from telegraph pole; iron post marked "958"	957.856
Rochester; ship spike in telegraph pole on north of track, 50 feet from center, about 45 feet east of center of road running north and south...	979.97
Trestle 527-B; iron pin driven to surface of cap of northeast bulkhead of, about ¼ mile east of Rochester	983.07
Trestle 527-C; on railroad spike on cap on northeast corner of, about ¼ mile west of South Etiwanda	978.94
South Etiwanda; 58.6 feet south of center of wagon road and 2.6 feet west of telegraph pole; iron post marked "981"	981.434
Trestle 528-A; railroad spike in cap northeast corner of	992.28
Declez station; railroad spike in telegraph pole, 75 feet northeast of and 51 feet northeast of railroad stake, marked "3600"	1,018.44
Sansavain; on south side of railroad track and 231 feet from southwest corner of depot building near fence; iron post marked "1063"	1,062.538
Telegraph pole marked "533," railroad spike in; 50 feet south of center of track and about 1¼ miles east of Sansavain station	1,103.49
Telegraph pole marked "534," on railroad spike in; on south side of track, pole whitewashed ½ its length, about ¼ mile west of Bloomington station	1,101.71
Telegraph pole marked "535," on railroad spike in; on south side of railroad track and 2,100 feet west from Bloomington	1,096.38
Bloomington; south side of railroad track, 87.9 feet from southeast corner of depot, 2.2 feet from telegraph pole and 7 feet from center of wagon road; iron post marked "1090"	1,089.579
Bloomington; in brick building at post-office, in sixth course of brick above foundation and second course from southeast corner of building owned and occupied by W. H. H. Easton, southwest corner of Orchard and Commercial streets; bronze tablet marked "1098"	1,098.441
Telegraph pole marked "536", on railroad spike in; on south side of railroad track, 50 feet from center of track and ¼ mile east of Bloomington station	1,069.88
Telegraph pole marked "537", on railroad spike in; on south side of railroad track, 2.7 miles west of Colton	1,051.31
Telegraph pole marked "538", on railroad spike in; on south side of railroad track, ¼ mile west of cement works and 1.7 miles west of Colton..	1,033.38
Cement Company's storehouse; in wall on north side of, 3.4 feet from east corner, 0.7 foot from top of foundation, 35.8 feet from center of track, and 1¼ miles west of Colton; bronze tablet marked "1006"	1,005.965
Colton; in corner of brick building at Transcontinental Hotel, in third course above top of corner post and in center of brick laid horizontally; bronze tablet marked "978"	978.373

COLTON TO VICINITY OF PALM SPRINGS ALONG SOUTHERN PACIFIC COMPANY'S TRACK.

	Feet.
Colton; in the front wall at southwest corner of Transcontinental Hotel; bronze tablet marked "978"	978.373
Trestle No. 540–C; southwest corner of, tack in bulkhead board	954.42
Cattle guard No. 541–K; tack in south end of east bulkhead board at east side of road crossing	992.2
Mound City station platform; hub and tack 2 feet east of west end of steps	1,060.8
Mound City; northeast corner of reservoir wall east of depot; copper bolt marked "1079"	1,079.080
Cattle guard No. 544–D; tack in north end of east bulkhead board	1,149.2
Redlands Junction depot; wire nail in walk at southwest corner of building	1,192.75
Redlands Junction; east of depot on west side of county road and south line of Southern Pacific Railroad's right of way; iron post marked "1201"	1,200.971
Brookside; west of siding, west side of county road, at southeast corner of Brookside vineyard; iron post marked "1301"	1,300.997
Culvert No. 547–F; tack in northwest corner in 6 by 6 inch timber	1,374.22
Culvert No. 548–L; tack in north end of west timber	1,450.83
County line; base of post	1,534.8
Trestle No. 551–A, opposite Moreno road; tack in north end of east bulkhead board	1,629.1
Trestle No. 552–A; wire nail in north end of west bulkhead	1,730.1
El Casco, east of; wire nail in south end of east bulkhead board trestle No. 554–A	1,870.9
San Timotes district school; northwest corner of grounds; iron post marked "1910"	1,910.328
Road crossing; wire nail in 2 by 4 inch post at southwest corner of culvert south of track	2,041.9
Milepost 557, between El Casco and Alexis; tack in top of	2,107.5
Alexis siding; tack in north end of bottom step at northeast corner of station platform	2,195.2
Milepost 559, 1 mile east of Alexis; tack in top of post	2,271.1
Township line between T. 3 S., R. 2 W., and T. 3 S., R. 1 W., north side of county road; iron post marked "2297"	2,296.998
Trestle 561–A; wire nail in south end of west bulkhead board	2,454.2
Beaumont; in the front wall at northwest corner of Gray's brick store and warehouse; bronze tablet marked "2575"	2,575.059
Milepost 563, wire nail in top of; post is ¼ mile east of depot in Beaumont.	2,581.33
Milepost 564, wire nail in top of	2,594.63
Milepost 565, wire nail in top of	2,564.66
Trestle No. 565–C; wire nail in south end of west bulkhead board	2,529.25
San Bernardino Forest Reserve monument; 1.5 miles north of railroad, 2 feet south of iron pipe filled with concrete on San Bernardino meridian, corner tps. 2 and 3 S.; iron post marked "2710"	2.710
Trestle No. 566–A; wire nail in south end of east bulkhead board	2,506.6
Banning, 2 miles west of; at road crossing; hub and tack 1.2 feet south of lookout post	2,478.3
Mile post 568; wire nail in top of	2,404.5
Banning; east side of Main street, south of track; tack in top of corner post to water box	2,321.3
Banning; in the west wall at northwest corner of Frazer brick block, opposite Hotel Banning; bronze tablet marked "2330"	2,329.94
Trestle 570–A; 1 mile east of Banning; wire nail in northeast bulkhead post	2,227.7

	Feet.
Trestle 570–H; wire nail in top of bulkhead post at northeast corner	2,141
Trestle No. 571–E; wire nail in north end of west bulkhead board	2,064.7
Mile post 573; tack in top of	1,955.1
Mile post 574; tack in top of	1,854.2
Cabayon; north of track in corner of stone-bordered walk 7 feet east of southeast corner of section-house grounds; iron post marked "1791"	1,790.972
Trestle 575–K; wire nail in top of bulkhead post at southeast corner	1,691.0
Trestle 577–D; 2½ miles east of Cabayon, wire nail in north end of east bulkhead board	1,543.3
Township line between T. 3 S., R. 2 E., and T. 3 S., R. 3 E., east of road crossing on north side of Southern Pacific Railroad Company's right of way; iron post, marked "1442"	1,441.998
Trestle 579–A; tack in north end of west bulkhead board	1,348.3
Trestle 581–A; 2¼ miles west of Whitewater siding, wire nail in south end of east bulkhead board	1,223.9
Trestle 582–A; wire nail in southeast corner of bulkhead board	1,154.89
Whitewater siding; south of track at northeast corner of section-house grounds; iron post, marked "1130"	1,129.986
Trestle No. 583–F, over Whitewater River, 30 feet east of west end of; tack in guard rail	1,105.9
Trestle No. 584–F; wire nail in northeast corner of bulkhead	1,039.9

LOS ANGELES TO SANTA MONICA ALONG SOUTHERN PACIFIC COMPANY'S TRACK.

Clement Junction; at intersection of fence lines; iron post marked "220".	219.97
University station; 1 foot west of telegraph pole and 65 feet south of southwest corner of depot; iron post marked "174"	174.351
Cienega siding; at northwest corner of fence for cattle corral and 50 feet west of center of track; iron post marked "118"	118.334
Trestle 494–A; on bolt on guard rail on southeast corner of	90.79
Ivy station; in southwest corner of fence of cattle guard at road crossing, 150 feet northwest of depot building; iron post marked "103"	102.58
Palms; in front brick wall at northwest corner of warehouse, fifth course of bricks above water table and in center of second course of bricks from north end of; bronze tablet marked "126"	126.209
Home junction; on east side of track near fence, about 80 feet east from center of railroad building and 48 feet from center of track; iron post marked "165"	164.623
Home junction; ¼ mile east of, railroad spike on brace post of fence opposite house	167.65
Santa Monica; one mile west of, on railroad spike on cattle guard at road crossing	110.59
Tunnel, west end of; on railroad spike of first bent, old railroad bench mark marked "BM"	33.34
Santa Monica; in brick wall of brick building used as bank on northeast corner of Oregon and Third streets; bronze tablet marked "79"	78.599
Santa Monica; 1 mile south of Long Wharf, on nail in 2 by 3 inch post 115 feet south of box 502 D	15.17
Trestle 503–C; on bolt in southeast end of south bulkhead cap at Santa Monica Canyon	24.73
Santa Monica; in concrete floor of railroad turntable foundation, 3.2 feet north of center of turntable, and 6 inches west of center of track at end of Long Wharf; copper bolt marked "17"	16.624

LOS ANGELES TO SAN FERNANDO ALONG SOUTHERN PACIFIC COMPANY'S TRACK.

Los Angeles; in the front wall of brick warehouse known as Junction Warehouse, at junction of San Fernando and Olympia streets; bronze tablet marked "306"	305.903

	Feet.
Los Angeles; in northeast granite post of Wagon Road bridge over Los Angeles River at Buena Vista street, second bent from south end of bridge, 12 feet from track of Southern Pacific Railroad, 18 feet from California Southern Railroad, ½ mile north of River station; copper bolt marked "314"	314.046
Los Angeles River; on spike in cap of northeast corner of bridge marked "481-E," 1 mile north of River station	326.68
Trestle 480-A; northeast corner of, on railroad spike in cap at railroad station 958+31, 2 miles north of River station	366.51
Trestle 479-B; on northeast corner of, on railroad spike in cap of bulkhead bent, 3 miles north of River station	372.56
Tropico; on railroad spike in telegraph pole 200 feet northwest of depot building	430.91
Tropico; 1.5 feet from northwest corner of fence around garden 200 feet north of depot building; iron post marked "432"	431.769
Trestle 476-C; in bulkhead cap northeast corner of, on railroad spike 1½ miles north of Tropico	459.27
Trestle 476-A; in cap on northeast corner of; on railroad spike ½ mile south of West Glendale	464.23
West Glendale; cross cut on stone coping near southwest corner of brick building of West Glendale Winery	468.67
Burbank; 1 mile south of, on railroad spike in telegraph pole painted white, and 140 feet from road crossing; post marked "474"	522.61
Burbank; on west side of railroad track, 51 feet from center of track and 117 feet northwest from northwest corner of depot building; iron post marked "563"	562.798
Trestle 472-B; on railroad spike in cap at northeast corner of, ½ mile north of Burbank	582.24
Telegraph pole 472; on railroad spike in, 1½ miles northwest of Burbank.	620.72
Telegraph pole 471; railroad spike in, about 2½ miles northwest of Burbank, on west side of track and 50 feet from center of track	681.57
Telegraph pole 470; on railroad spike in, about 800 feet south of Dundee station	746.48
Dundee; near post-office building, 12.2 feet from northeast corner of building and 4.2 feet from eucalyptus tree and 600 feet west of railroad station; iron post marked "760"	759.508
Trestle 469-A; on northeast corner of, on 40-penny wire nail in north bulkhead cap	790.91
Telegraph pole 469; on railroad spike in; about 450 feet south of Roscoe station	807.91
Trestle 468-A; on railroad spike in cap of north bulkhead of, 1,500 feet northwest of Roscoe station	825.62
Trestle 467-B; on railroad spike in bulkhead cap northeast end of, about 400 feet north of pole marked "468"	861.19
Trestle 466-A across Tejunga Creek; on railroad spike in cap of northwest bulkhead bent of, 2 miles south of Pacoima station	909.75
Trestle 465-B; on railroad spike in bulkhead cap, southwest corner of	915.11
Milepost 465; ½ mile north of, on railroad spike in railroad signpost at road crossing	953.78
Pacoima; at corner of fence, 165 feet northwest of northwest corner of brick depot building; iron post marked "1013"	1,012.53
Trestle 463-B; on northwest corner of, on railroad spike in cap of north bulkhead bent	1,048.47
Telegraph pole 463; on ship spike on north side of, about 900 feet south of depot at Fernando, and at southeast corner of warehouse building	1,069.84
Fernando; ½ mile south of, on ship spike in railroad signpost at road crossing, 600 feet south of Pacoima Creek crossing	1,041.50

FROM FERNANDO EASTWARD ON ROAD UP TUJUNGA CANYON, VIA TUJUNGA SCHOOLHOUSE.

	Feet.
Railroad crossing; 1⅛ miles from, 8-penny wire nail in notch on mountain mahogany tree, about 140 feet southwest of road	1,061.84
Allum ranch, on San Fernando grant; about 3½ miles south of San Fernando, on ship spike driven in post, 4 feet from top of, at southeast corner of 40-acre tract	1,073.33
Little Tujunga Creek; 250 feet west of descent to, on notch on scrub bush 110 feet south of road	1,063.1
William Allan's house; 800 feet southwest of and 65 feet south of wagon road on nail in notch cut on sycamore tree 24 inches in diameter	1,054.7
Tujunga schoolhouse; 12 feet from northwest corner of, on notch cut on pepper tree, about 5 miles southeast of Fernando	1,131.227
Summit of road; 35 feet south of, 8-penny wire nail on notch in scrub bush 8 inches in diameter, 6 miles southeast of Fernando	1,185.16
Summit of road; about 600 feet east of, 40 feet south from corner of old orchard, 4 feet north of crooked tree and 20 feet from center of wagon road, in sec. 10, T. 2 N., R. 14 W.; iron post marked "1187"	1,187.237
Point where road turns south to creek; on nail in notch cut on scrub bush 20 feet north from center of road 6½ miles from Fernando	1,201.8
Montevista; on road going south to, on notch cut in scrub bush 7¼ miles southeast from Fernando	1,269.9
Big Tujunga Canyon; 450 feet northeast of point where road starts up, on notch cut in cottonwood tree 24 inches in diameter, 100 feet north of road in canyon, and 8 miles from Fernando	1,299.44
Big Tujunga Canyon; ¼ mile above mouth of, on 8-penny wire nail in notch cut on cottonwood tree 20 inches in diameter, at foot of bluff on southeast side of canyon	1,328.45
Mrs. M. A. Johnson's; at southwest corner of house of, on 8-penny wire nail in notch cut on cottonwood tree 24 inches in diameter about 2 miles north of Montevista, on Big Tejunga River, 1¼ miles above mouth of canyon	1,400.337
S. A. Johnson's house, 57 feet from northwest corner of; on 8-penny wire nail in notch cut in leaning sycamore tree 15 inches in diameter, 15 feet south of wagon road and about 3 miles north of Montevista	1,417.71
S. A. Johnson's house, ¼ mile east of, 10 feet south of wagon road on township line, sec. 1, T. 2 N., R. 13 W.; iron post marked "1470"	1,470.298
S. A. Johnson's house, 1¼ miles east of; on 8-penny wire nail in notch cut on cottonwood tree 24 inches in diameter and 10 feet south of small ditch.	1,491.10
Barclay's dam site, ¼ mile from gate to; on 8-penny wire nail in notch cut on willow tree 10 inches in diameter and 30 feet south of road	1,542.559
Tunnel, ¼ mile north of; on 8-penny wire nail in notch cut on cottonwood tree 15 inches in diameter, in center of group, near small summit north of crossing of Tejunga Creek	1,650.24
Turn of road at creek crossing; on 8-penny wire nail in notch cut on cottonwood tree 30 inches in diameter	1,679.93
Montevista, 5 miles east of; on nail in notch on cottonwood tree 12 inches in diameter, 15 feet south of road, 100 feet from creek crossing	1,747.72
Thomas Ely's ranch; on 8-penny wire nail in notch cut on live oak tree on summit near barbed-wire fence 4 miles northeast of Montevista	1,797.36
Bee ranch; on 8-penny wire nail in notch cut on cottonwood tree, on first bench above creek to north of road, 4½ miles northeast of Montevista	1,807.34
L. Fogel's cabin, 15 feet from northwest corner of; 8-penny wire nail on notch on live oak tree 12 inches in diameter about 6 miles northeast of Montevista	1,841.34

	Feet.
Creek crossing on brushy flat, about 800 feet from; 6½ miles northeast of Montevista, in face of rock 14 by 5 by 3 feet, 2.7 feet above surface of ground; bronze tablet marked "1888"	1,888.145
Hoyt's ranch; 300 feet northeast of, on 10-penny wire nail in notch cut on live oak tree 36 inches in diameter, 8 miles from Montevista	1,930.79

ON TRAIL UP TUJUNGA CANYON.

Hoyt's ranch; ¾ mile east of, on 10-penny wire nail in notch cut on live oak tree 16 inches in diameter, on end of point where creek turns to left, 30 feet from trail up Big Tujunga River	1,983.69
Hoyt's ranch; 1½ miles east of, 15 feet to left of trail, on 8-penny wire nail on notch cut on sycamore tree 12 inches in diameter	2,015.74
Hoyt's ranch; about 2 miles east of, on 8-penny wire nail in notch cut on live oak tree 30 inches in diameter and 35 feet south of trail	2,076.33
Hoyt's Ranch; 2¾ miles from, in rock at foot of slope, pine tree growing in rock; copper bolt marked "2115"	2,114.815
Hoyt's ranch; 4 miles northeast of, on 8-penny wire nail in notch cut on cottonwood tree 12 feet in diameter, 4 feet north of trail and opposite point of rocks	2,227.09
Fox Creek; on south bank of creek 15 feet north of trail at, on 8-penny wire nail on notch cut on alder tree 12 inches in diameter	2,304.77
Branch Creek; 100 feet from small falls in, on 8-penny wire nail in notch cut on root of sycamore tree 14 inches in diameter	2,367.73

TRAIL OVER RIDGE TO JUNCTION OF MILL CREEK AND NORTH TUJUNGA CREEK.

Bowlder 7 by 5 by 3 feet, on trail where it is in sight of Big Tujunga, about 1,500 feet up ridge; copper bolt marked "2593"	2,593.405
Small summit, 1.1 miles on trail; in flat granite slab; copper bolt marked "3526"	3,525.791
Junction of North Fork and Mill creeks, ½ mile from; in granite bowlder 12 feet north of trail; copper bolt marked "3935"	3,934.700
Summit of ridge, 50 feet east of; in granite bowlder 2 by 1 feet; copper bolt marked "4398"	4,398.079
Summit of ridge; on 8-penny wire nail in notch cut in stump of 8-inch chapparal bush south of flag pole	4,407.70
Junction of Mill Creek and North Fork of Big Tujunga; near trail from latter, in granite bowlder; copper bolt marked "3056"	3,055.973

ON TRAIL DOWN NORTH FORK TO JUNCTION WITH MAIN TUJUNGA.

Vertical Falls, on North Fork, 35 feet in height; in ledge of rock on north side of creek, about 6 feet above water and 20 feet north of falls; bronze tablet marked "2879"	2,879.228
Falls where North Fork empties into Big Tujunga Creek, 40 feet south of; in granite bowlder 6 by 5 by 4 feet on north side of North Fork where drift log is lodged; copper bolt marked "2671"	2,670.477

TRAIL FROM JUNCTION OF NORTH TUJUNGA UP MILL CREEK.

Old mill; on nail in notch cut on alder tree 24 inches in diameter on bank of creek near and 5 feet from line of upright post	3,441.5
Wagon road; 20 feet from end of, in rock on south bank of Mill Creek at point where trail goes over ridge to Big Tujunga Creek; copper bolt marked "3463"	3,463.249

TRAIL FROM MILL CREEK ACROSS RIDGE AND UP BIG TUJUNGA TO TRAIL BETWEEN PINE FLATS AND MOUNT WILSON.

	Feet.
Summit of ridge between Mill and Big Tujunga creeks; 6 feet south of trail, an 8-penny wire nail in manzanita plug	4,291.26
Big Tujunga Creek; in bowlder 4 by 6 by 2 feet in bed of stream, 25 feet south of trail and 60 feet east of canyon where trail goes down from ridge from Mill Creek; oak stake driven in bank marked "B.M." and near dead willow tree in stream; copper bolt marked "3266"	3,265.566
Big Tujunga Creek; an 8-penny wire nail in notch cut in cottonwood tree 18 inches in diameter, near shed below old cabin, ¼ mile east of where trail goes into Big Tujunga from Mill Creek	3,308.82
Alder Creek; in bed of, at junction with Big Tujunga, in hole drilled in bowlder 8 by 8 by 12 feet; copper bolt marked "3415"	3,414.962
Trail between Barley Flats and Mount Wilson, 40 feet east of; in face of granite ledge facing Tujunga River 60 feet east of pine tree 18 inches in diameter; bronze tablet marked "4046"	4,045.638

ROAD UP MILL CREEK ACROSS DIVIDE AND DOWN ALISO CANYON TO ACTON.

Mill Creek, end of road at, 2¼ miles north of; 10-penny cut nail in notch in leaning sycamore tree 18 inches in diameter, on east side of road	3,911.35
Divide between Mill Creek and Aliso Canyon; 10 feet east of road; iron post marked "5030"	5,030.464
Junction of trail from east with road, 1,230 feet north from summit; nail in notch cut on chaparral bush	4,986.05
Dump Canyon; at foot of grade at, nail in notch cut on double white oak tree on west side of road	4,531.34
Smith's stamp mill, 250 feet east of; in bowlder 6 by 6 by 4 feet at junction of roads going up Dump and Tie canyons; copper bolt marked "4452".	4,451.598
Doctor Smith's house, 120 feet west of; southeast corner of, on notch cut in cottonwood tree 24 inches in diameter, on east side of creek, 75 feet east of main road and 10 miles southeast of Acton	4,012.2
Acton; 7¼ miles southeast of, on notch on cottonwood tree 12 inches in diameter, 40 feet southeast of road at foot of long ridge	3,509.7
Big Tujunga mines and Jones's ranch, intersection of roads to; 18 feet south of signboard and 6 miles east of Acton; iron post marked "3348"	3,347.651
Stone house, 30 feet from northeast corner of, on big ridge 3 miles south of Acton; copper bolt marked "3021"	3,021.201
Aliso Canyon, mouth of; 1 foot west of signboard and 2 miles east of Acton; iron post marked "2829"	2,829.211
Acton; in brick wall southwest corner of hotel; bronze tablet marked "2700"	2,700.294

ACTON TO FERNANDO ALONG SOUTHERN PACIFIC COMPANY'S TRACK AND WAGON ROAD.

Trestle 429-F; southwest corner of, railroad spike in cap of trestle	2,520.16
Ravenna station; on east side of track, 58 feet east of door of office of depot building and 3.5 feet from gum tree; iron post marked "2468"	2,467.685
Trestle 431-O; on northeast corner of, railroad spike in north bulkhead cap	2,322.96
Trestle 432-C; southeast corner of, on railroad spike in cap of bulkhead bent	2,279.88
Trestle 433-D; 40 feet north of, on nail in notch cut on live oak tree 24 inches in diameter	2,214.43
Trestle 434-G; on northwest corner of, on railroad spike in cap of north bulkhead	2,127.31
Trestle 435-A; 60 feet north of, on nail in notch cut on live oak tree 24 inches in diameter on north side of track and west side of small canyon.	2,062.84

	Feet.
Steel bridge No. 5, on concrete pier on bulkhead at northwest corner of; copper bolt marked "1913"	1,913.053
Steel bridge No. 11; on concrete bulkhead pier of, in Soledad Canyon, 11 miles south of Acton; copper bolt marked "1822"	1,821.790
Trestle 438–C; on northeast corner of, on railroad spike on north bulkhead cap	1,808.81
Lang's station; at north end of picket fence, 45 feet north of center of track, between hotel building and section house; iron post marked "1690"	1,689.827
Trestle 440–K; on railroad spike on southwest corner of south bulkhead of, about 1¼ miles south of Lang's	1,675.06
Trestle 442–D; south end of, on railroad spike on southwest corner of bulkhead	1,611.08
Trestle 442–J; on railroad spike on southwest corner of south bulkhead cap of	1,552.31
Trestle 444–E; on 60-penny nail on southwest corner of south bulkhead cap of	1,436.09
Trestle 446–A; on railroad spike on southwest corner of south bulkhead cap of	1,400.55
Trestle 446–H; on railroad spike on southwest corner of south bulkhead cap of	1,392.28
Road over tunnel 4.6 feet from corner of secs. 24, 23, 13, and 15, T. 4 N., R. 15 W., 15 feet from fence; iron post marked "1565"	1,565.006
Trestle 448–E; on railroad spike at southwest corner of south bulkhead cap of	1,242.97
Trestle 449–G; on railroad spike southwest corner of south bulkhead cap of	1,215.10
Tunnel 25; 300 feet north of, on live oak tree 15 inches in diameter, in small canyon on south side of track	1,187.2
Saugus; 18 inches from north corner of pump house, 18 feet from center of track and 33 feet from south corner of depot building; iron post marked "1171"	1,171.097
Trestle 453–A; on railroad spike in brace cap of south bulkhead wing, on southwest corner of	1,215.25
Newhall; between tree and telegraph pole 27 feet south of depot and 30 feet from center of track; iron post marked "1273"	1,272.508
Road over tunnel; on north side of, on sycamore tree 36 inches in diameter, inside of fence at foot of steep grade over San Fernando Mountain, about 2 miles south of Newhall	1,417
Road over tunnel; on oak tree 24 inches in diameter, west side of road, ¼ mile north of summit and 400 feet south of Bronson's house	1,647.5
Road over tunnel; San Fernando Pass, in east side of wall of thoroughcut, 50 feet south of north end of cut and 4 feet above floor of road; bronze tablet marked "1799"	1,798.637
Road over tunnel; on sycamore tree 60 feet south of adobe house belonging to L. C. Watson, ¼ mile south of summit of pass and 30 feet west of road	1,549.3
San Fernando Tunnel; ¼ mile south of south end of, at south end of white fence at end of yard at section house; iron post marked "1417"	1,416.63
Tunnel Camp; on north bulkhead cap of trestle, ¼ mile south of	1,337.89
Milepost 460, near; on railroad spike on southwest corner of south bulkhead cap of trestle 180 feet long	1,230.37
Trestle 462–B; on railroad spike on northwest corner of north bulkhead cap	1,081.33
San Fernando; in southeast corner of brick wall of McClay & McClay Co.'s building on Johnson street; bronze tablet marked "1066"	1,065.997

AGUA DULSE CANYON.

	Feet.
J. M. Talbot's house, 1¼ miles west of; 2 feet south of southeast corner of adobe house; iron post marked "2258"	2,257.840

MINT CANYON.

Railroad line in Soledad Canyon, 2 miles north of; in flat rock 12 by 12 by 8 inches on side of hill, about 30 feet north of spring; copper bolt marked "1556"	1,555.911
Mouth of canyon, 3 miles from; nail in notch cut on sycamore tree 24 inches in diameter on west side of road, 100 feet west of road in creek	1,698.86
W. H. Thomas's cabin, at northwest corner of, in sec. 2, T. 5 N., R. 15 W., 4¾ miles from mouth of canyon; iron post marked "1778"	1,778.121

MOUTH OF ALISO CANYON, ALONG SOUTHERN PACIFIC COMPANY'S TRACKS TO UNA LAKE, THENCE EASTWARD, BY WAGON ROAD, THROUGH EAST PALMDALE TO LITTLE ROCK.

Telegraph post 424, 150 feet south of; ship spike in signboard at road crossing on north side of road, 3 miles north of Acton	2,967.6
Trestle No. 422-E; driftbolt in southwest corner of west bulkhead cap of, 5 miles north of Acton	3,090.87
Trestle 422-B; driftbolt in wing brace cap at southeast corner of south end of, 1 mile south of Vincent and 300 feet south of road crossing	3,147.71
Vincent, 500 feet north of depot, in corner of jog of fence, and 500 feet west of center line of sec. 22, T. 5 N., R. 12 W.; iron post marked "3219"	3,218.679
Vincent, 1 mile north of; on 8-penny wire nail in top of southwest corner of drain box 420-A	3,088.35
Trestle 419-A; on driftbolt on northwest corner of north bulkhead cap of, 2 miles north of Vincent	2,983.88
Canal under railroad track; on head of bolt in cap of north bulkhead on northeast corner of trestle over, 3½ miles north of Vincent	2,848.32
Harold, 300 feet east of; on stake near signpost marked "West Palmdale 2 miles"	2,821.5
Telegraph pole marked "417;" on railroad spike in, on west side of railroad, ½ mile north of Harold	2,803.11
Una Lake, 15 feet southeast from southeast corner of bunk house of South Antelope Valley Irrigation Company, on lot 8, sec. 3, T. 5 N., R. 12 W.; iron post marked "2820"	2,819.692
East Palmdale, ½ mile south of; in corner of fence, 40 feet north of center of road to Little Rock from East Palmdale in sec. 6, T. 6 N., R. 11 W., 450 feet northwest of section corner; iron post marked "2682"	2,681.559
Northeast corner of sec. 4, T. 5 N., R. 11 W., ½ mile east of; on nail in plug 4 inches from corner post of fence on south side of road from East Palmdale to Little Rock, and 2¾ miles from Little Rock	2,696.18
Little Rock, 1 mile west of; on nail in notch cut in palm tree 10 inches in diameter at junction of roads from East Palmdale to Little Rock and Foothills road	2,820.85
Little Rock, inside of fence of Chaplin ranch, east side of road, 54 feet east from post-office building and 25 feet east of ¼ corner on west side of sec. 13, T. 5 N., R. 11 W.; iron post marked "2910"	2,910.169
Strawberry Peak, triangulation station "Lucas;" about 2 miles northwest from San Gabriel Peak; trail from Tejunga Canyon to Switzer's camp passes over west end of Peak in rock on highest point; elevation determined by vertical angles; copper bolt marked "VA 6150"	6,150
Fernando triangulation station, a point 4.72 miles southeast of and 5 miles southwest of Iron Point; in rock on highest point, around which is built a mound of stone 6 feet at base and 5 feet in height; elevation determined by vertical angles; copper bolt marked "VA 2974"	2,974

COLTON TO RIVERSIDE, ALONG LINE OF MOTOR RAILROAD.

Colton, 1 mile south of; on railroad spike in top of bottom plank of cattle guard 922.89
Santa Anna River; on railroad spike in northeast corner of east bulkhead bent cap 1¼ miles south of Colton 916.75
Milepost 542, 600 feet south of; on northwest corner of top of coping of stone arch over drainpipe on north side of track 946.32
Telegraph pole marked 544; on railroad spike in, on west side of railroad 2 miles north of Riverside Junction 977.46
Telegraph pole marked 545; on railroad spike in, on left side of track 1 mile north of Riverside Junction 936.05
Telegraph pole marked 546; on railroad spike in, 100 feet west of corner of Massachusetts and Kansas avenues, near Riverside Junction 890.46
Riverside; in alcove on the right of main entrance to Loving Opera House, 4 feet above the sidewalk and 2.9 feet above copper bolt corresponding to official city datum, elevation of which datum, as obtained from city engineers, is 848.777; bronze tablet marked "851" 850.753

COLTON TO SAN BERNARDINO, ALONG LINE OF MOTOR RAILROAD.

Colton, ½ mile northeast of; on railroad spike on cap of northeast bulkhead bent of northeast corner of trestle 985.99
Lyle Creek; in northeast cylinder on east side of wagon road bridge over, 1 mile west of San Bernardino; copper bolt marked "1007" 1,006.786
San Bernardino; in stone on northeast corner of court-house building; bronze tablet marked "1048" 1,047.758

RIVERSIDE, VIA WAGON ROAD, TO BOX SPRING.

Riverside, Santa Fe depot; wire nail between corner curbstone and concrete of sidewalk, north corner of Eighth street and Pachappa avenue.. 875.23
Riverside, south side of Eighth street; nail in root of fifth pepper tree west of Kansas avenue 919.74
Riverside, corner of Eighth street and Iowa avenue; tack in top of north wall of brick well of Gage irrigation system 996.8
Gage Canal at Eighth street, in concrete bulkhead north of bridge; copper bolt marked "1019" 1,019.021
Box Spring grade; top of pipe culvert, projecting 1 inch from masonry on south side of road 1,041.225
Box Spring grade; hub and tack, north bank of road at sharp turn, 1.8 miles from canal crossing 1,332.3
Box Spring grade; tack in top of second post east of end of north railing at fill 1,384
Box Spring grade; hub and tack between road and bowlder on north side, where road forks to Box Spring 1,469
Box Spring road crossing, north of; hub and tack 9 feet east of railroad track 1,536.3
Box Spring station, near crossing of Box Spring grade and railroad, 65 feet west of track, 30 feet west of road; iron post marked "1539" 1,539.264

BOX SPRING, VIA SOUTHERN CALIFORNIA RAILWAY TRACK AND HIGHGROVE, TO RIVERSIDE.

Box Spring; hub and tack 2.5 feet east of whistling post, ½ mile north of spring 1,431.8
Box Spring; hub and tack 3.5 feet east of rail on prolongation of center line of Eighth street 1,235
Box Spring, ½ mile south of Blaine street; hub and tack 3 feet east of lookout post at road crossing 1,114.8
Trestle No. 2; Gage Canal crossing; nail in top of pile 1,022.7

	Feet.
Southern Pacific motor crossing; top of rail	966.4
Highgrove, 1 mile south of; nail in 6 by 14 inch timber of open culvert north of road, 1.5 feet east of rail	955.08
Highgrove depot; nail in 12 by 12 inch foot block, under south column of east bent to water tank tower	943.80
Highgrove; depot park south end of diamond-shaped lawn; iron post marked "945"	944.681
Iowa avenue crossing, top of rail	926.2
Highgrove station, 1.4 miles southwest of; trestle No. 9, nail in east end of south floor beam	890.47
Riverside, north of; motor crossing, hub and tack 3 feet east of telegraph pole, east of Southern Pacific track and west of Southern California track	878.7

BOX SPRING TO LAKE VIEW.

Box Spring, north of siding; 65 feet west of Southern California Railway track and 30 feet west of road at crossing of Box Spring grade and railroad; iron post marked "1539"	1,539.264
Box Spring, 1.4 miles east of, 6 feet north of Moreno road; hub and tack.	1,557.8
Moreno road; summit	1,598.3
Bear Valley flume; tack in top of well to cut-off valve, under lid	1,593.3
Alessandro boulevard and Heacock street; tack in northwest corner post.	1,565.4
Alessandro boulevard and Heacock street, at northeast corner of street, between T. 3 S., R. 3 W., and T. 3 S., R. 4 W.; iron post marked "1565".	1,564.652
Amanda post-office, opposite; hub and tack 8 inches north of guide post..	1,565.4
Lassel street and Alessandro boulevard; tack in southwest corner post...	1,585.9
Summit, Alessandro boulevard	1,610.5
Nason street on Alessandro boulevard, first telegraph pole east of; hub and tack	1,587.4
Petitt street and Alessandro boulevard, southwest corner of; wire nail in root of Eucalyptus tree	1,588.9
Moreno schoolhouse; tack in north end of bottom step, west entrance to.	1,609.6
Moreno, in front wall of brick store, southeast corner of streets; bronze tablet marked "1600"	1,599.796
Moreno, 1 mile southeast of; circle chiseled on rock at south side of road at point of hill	1,581.6
San Jacinto road, 2 miles southeast of Moreno; hub and tack 2½ feet east of end post in south line of fence road	1,492.2
Lake Bottom and Colony Heights road forks; hub and tack	1,448.9
Lake Bottom road, 35 feet west of; circle chiseled on rock 3½ feet high at east point of hill	1,429.3
Lake Bottom road, 50 feet west of; in granite bowlder 2 feet high, 12 by 5 feet, at east point of hill 3 miles north of Lakeview; copper bolt marked "1430"	1,429.97
San Jacinto River bridge, north end of; tack in guard rail	1,424.2
Lakeview, 1½ miles north of, at point of hill; hub and tack 25 feet west of road	1,426.9
Lakeview Hotel, northeast corner of porch; tack in guard post flush with concrete walk	1,449.9
Lakeview; northeast angle of lawn, public school grounds; iron post marked "1468"	1,468.023

LAKEVIEW TO PERRIS.

Lakeview, 1½ miles west of; tack in top of 4 by 4 inch corner post 2 feet high, wire-net fenced olive grove	1,443.1
Perris road; hub and tack at junction of old cross-country road and new county road 6 miles east of Perris	1,452.6

	Feet.
Perris road and Juniper Flat road; hub and tack at junction of	1,467.4
Perris road culvert; tack in north end of west sleeper 3½ miles east of Perris	1,415
San Jacinto River truss bridge; tack in west end of north stringer	1,411.97
Perris, 1 mile east of; tack in sill of water flume north side of San Jacinto avenue, west of brick house	1,416.9
Perris, Southern California Railway depot; copper tack in brick ledge in alcove north of arch entrance	1,452.45
Perris, Santa Fe depot; south wall of brick corridor; bronze tablet marked "1456"	1,455.897

PERRIS, VIA SOUTHERN CALIFORNIA RAILWAY TRACK TO BOX SPRING.

Perris, 1 mile north of; hub and tack between track and W. X. post	1,467.6
Perris, 2½ miles north of; hub and tack west of blazed telegraph pole	1,477.7
New Hampshire street crossing; top of rail	1,490
Schneider School; hub and tack west of blazed telegraph pole east of railway and north of road	1,498.3
Indian school, north of road to; hub and tack west side of blazed telegraph pole east of track	1,495.8
Val Verde; brick warehouse platform; tack in north end of sill	1,504.2
Val Verde; east wall of brick warehouse, 4½ feet above ground; copper bolt marked "1509"	1,509.07
Val Verde, ¾ mile north of; hub and tack 3.8 feet east of rail, 6.5 feet north of road crossing	1,513.3
Alessandro, 1 mile south of; hub and tack 3 feet east of railway "Lookout" post-road crossing	1,525.6
Alessandro siding; tack in south end of west sill of warehouse	1,534.53
Alessandro; depot platform; tack in northwest corner sill of	1,536.48
Alessandro, 1 mile north of; hub and tack 1.2 feet west of blazed telegraph pole east side of track	1,547.07
Trestle No. 9; wire nail in northwest bulkhead pile	1,524.3
Box Spring siding; base of rail	1,536.1

RIVERSIDE, VIA SOUTHERN CALIFORNIA RAILWAY TRACK, TO ARLINGTON.

Riverside, Fourteenth street; trestle No. 16; wire nail in west end of south floor beam	872.39
Long trestle No. 17; wire nail in top of pile, north end of	877.8
Mount Pachapa, south of; hub and tack north of road crossing 2½ feet east of W. X. post	884.1
Olivewood Cemetery; at canal crossing, ¼ mile north of Pachapa siding; iron post marked "863"	862.585
Washington street; tack in 6-inch timber of railroad culvert north of street crossing	876.9
Casa Blanca, in southeast concrete foundation pier of depot platform, 1 foot under ground, protected by covered tin cylinder 4 inches high; copper bolt marked "861"	860.976
Jefferson street crossing; top of rail	850.7
Canal crossing; wire nail in top of abutment compression block south end of east truss, 1 mile southwest of Casa Blanca	846.35
Trestle No. 20; wire nail in south bulkhead board	841.44
Jackson street crossing; top of rail	844.8
Arlington; tack in sloping platform joining main platform of railway depot	817
Arlington, center of Southern California Railway depot park; iron post marked "814"	814.489

ARLINGTON, VIA EL SOBRANTE, TO INDIAN SCHOOLS.

	Feet.
Victoria avenue, south side; wire nail in root of first pepper tree west of Van Buren street	880.78
Mocking Bird Canyon, top of grade into; hub and tack 10 feet south of road	985.1
Gage Canal, trestle No. 19; tack in west end of sill south of road under	944.2
Mocking Bird Canyon; hub and tack 6 feet north of road and 60 feet southeast of point where double rock promontory disappears from view	1,048.5
Corral; 15 feet north of road on rise of ground opposite; hub and tack	1,180.7
Mocking Bird Canyon, south of bowlder dam (natural) on Hogback 50 feet south of road; iron post marked "1219"	1,218.736
Ridge running into canyon, top of; hub and tack north side of road	1,291.6
Divide; circle chiseled on rock at top of grade running south out of Mocking Bird Canyon	1,450.37
Divide; hub and tack 10 feet east of road, top of grade running south into El Sobrante grant	1,479.1
Crossroads, 140 feet west of; circle chiseled on rock at foot of hill	1,442.41
El Sobrante, 75 feet northeast of Gavilan mines and tin mine road crossing; iron post marked "1447"	1,447.023
Sheep corral, west of; circle chiseled on rock opposite three elder trees	1,515
French John's vineyard, south of; hub and tack in fork of roads to Perris and Santa Rosa mine	1,630
North Mount Glen; wire nail in root of fifth Eucalyptus tree east of corner opposite district school	1,651.3
North Mount Glen, in northwest corner of school grounds and at the southeast corner of Elsinore and Corona road crossing; iron post marked "1651"	1,651.247
Summitt between Perris Valley and North Mount Glen; hub and tack north side of road 65 feet west of bowlder pile	1,703.3
Indian school road, 1 mile west of Southern California Railway; circle chiseled on rock at southwest corner of fenced orchard	1,580.1
Perris Indian schools; in the brick balcony south side of steps at southwest entrance to main building; copper bolt marked "1456"	1,456.373

LAKEVIEW TO SAN JACINTO.

Lakeview, 1 mile west of; hub and tack at road forks	1,444.4
Peach orchard, opposite to; hub and tack 2 feet north of road	1,437.4
Lakeview, 3½ miles east of, opposite entrance to Chinese gardens; hub and tack south of road	1,447.1
Chinese gardens, 1½ miles southwest of; hub and tack 2 feet west of gutter on west side of road	1,456.2
San Jacinto road; tack in southwest corner post of culvert	1,453.93
San Jacinto road; tack in southeast corner of culvert, where road turns east	1,465.3
Casa Loma ranch, at northeast fence corner; San Jacinto road and township line between T. 4 S., R. 2 W., and T. 4 S., R. 1 W.; iron post marked "1466"	1,465.794
Central avenue, northwest end; wire nail in root of cottonwood tree 8 feet inside of fence, north side of county road	1,455.85
Central avenue, small bridge; wire nail in top of 4 by 4 inch bulkhead post at northeast corner	1,483.89
Central avenue, north side of; wire nail in root of double willow	1,500.58
Central avenue and Beaumont road, northwest corner of; wire nail in root of cottonwood tree	1,520.83

	Feet
San Jacinto public school building; tack in northeast corner of porch of east entrance	1,558
San Jacinto, north side of east entrance of public-school building; bronze tablet marked "1562"	1,561.663

SAN JACINTO, VIA SOUTHERN CALIFORNIA RAILWAY TRACK, TO PERRIS.

San Jacinto; tack in sill of west waiting room window	1,538.9
Railroad cut, north end of; hub and tack 35 feet north of telegraph pole, 3.3 feet east of rail	1,564.2
Hemet, north of west entrance to open waiting room; tack in projection of floor	1,590.5
Hemet, grammar-school building; nail in brick footing to foundation between steps and cupola	1,587.48
Hemet, grammar school; in brick column on north side of steps; bronze tablet marked "1591"	1,591.027
Trestle No. 3, north corner of; wire nail in top of pile	1,574.05
Canal crossing; wire nail in southwest corner of wagon bridge north of track	1,528.7
Eagan siding; wire nail in southwest corner of car-house platform	1,516.08
Eagan siding, ¾ mile west of; wire nail in northwest corner of canal sand box north of track	1,505.7
Eagan siding, 1 mile southwest of, on township line between T. 5 S., R. 2 W., and T. 5 S., R. 1 W., and north line of right of way; iron post marked "1502"	1,502.449
Winchester, 2¾ miles east of; wire nail in northwest bulkhead post of railroad culvert	1,495.06
Open railroad culvert; wire nail in 2-inch center plank	1,489.4
Winchester, ¾ mile east of; wire nail in 3-inch plank at northeast corner of railroad culvert	1,480.6
Winchester; wire nail in southwest corner of walk at northwest corner of platform at depot	1,469.8
Winchester, front of, east of entrance of public-school building; bronze tablet marked "1470"	1,469.944
Winchester, 1 mile west of; hub and tack 2.6 feet out from blazed telegraph pole	1,460.3
Road crossing, 55 feet west of; hub and tack 5 feet south of rail	1,473.6
Winchester, 3¼ miles northwest of; wire nail in top of post northeast corner of railroad culvert	1,479.77
Benedict school, northeast corner of grounds and northeast corner of sec. 24, T. 5 S., R. 3 W.; iron post marked "1500"	1,499.636
Menifee siding; wire nail in southeast corner of car-house platform	1,476.56
Siding, 1 mile northwest of; wire nail in north corner of railroad culvert.	1,450.45
Road crossing, section line between secs. 11 and 14; top of rail	1,445.1
Perris, 3¾ miles southeast of; tack in southwest corner of cattle guard	1,426.77
Trestle No. 2; wire nail in top of southeast bulkhead pile	1,412.10
San Jacinto River crossing, trestle No. 1; wire nail in north end of east bulkhead board 2 miles southeast of Perris	1,411.20
Perris, 1¼ miles southeast of; wagon-road culvert south of railroad; wire nail in southwest end of	1,412.9

PERRIS, VIA SOUTHERN CALIFORNIA RAILWAY TRACK, TO ELSINORE.

Perris, 1¼ miles south of; chisel mark top of stone pipe, water gate east of road	1,438.90
Trestle No. 10; wire nail in east end of north bulkhead board	1,408.51

	Feet.
Box culvert, 3½ miles south of Perris; wire nail in southwest corner of...	1,402.68
Canyon, 4½ miles south of Perris, 30 feet north of road where it leaves canyon and takes over hills to the west; iron post marked "1399".....	1,399.080
Box culvert south of fence, wire nail in corner of.....	1,376.2
Box culvert, 6½ miles south of Perris; wire nail in corner of, square cut..	1,356.3
Trestle No. 11; wire nail in bulkhead board southwest corner of.....	1,345.89
Trestle No. 12; wire nail in bulkhead board southwest corner of.....	1,329.73
Trestle No. 13, north of Menifee road; wire nail in northwest corner of bulkhead board.....	1,315.22
Menifee road, east of bridge over San Jacinto River and east of railroad track on south side of road; iron post marked "1318".....	1,317.980
Elsinore Junction, ¾ mile north of; circle chiseled on bowlder 4 feet high, 12 by 4 feet, 12 feet east of track.....	1,279.223
Elsinore Junction; wire nail in flaring end of railroad culvert under main track between the ends of Y.....	1,279.5
Elsinore, 1 mile east of; hub and tack 40 feet west of blazed telegraph pole, 3 feet north of rail and east of row of encalyptus trees.....	1,282.7
Elsinore, Santa Fe depot; tack in corner of coping on west side of open waiting room.....	1,274.29
Elsinore; Consolidated Bank building, in the brick work on right side of corner entrance; bronze tablet marked "1305".....	1,305.003
Elsinore, north corner of Collier avenue and Second street; wire nail in root of pepper tree.....	1,283.56

ELSINORE TO TEMESCAL.

Elsinore, 2½ miles northwest of; hub and tack 4 feet south of corner tree in evergreen hedge.....	1,264.4
Terra Cotta City, spur track to; southwest corner of trestle over canal; wire nail in 4 by 8 inch bulkhead timber.....	1,249.91
Terra Cotta City and Temescal road forks, north of, 3½ miles from Elsinore; iron post, marked "1258".....	1,257.596
Canyon road to Temescal, 1¼ miles northwest of railroad trestle; southwest of road to brick house on hill; wire nail in root of cottonwood tree.	1,241.1
Telephone road, east of junction with; nail in root of cottonwood tree 4 feet in diameter, north side of road.....	1,208.82
Canal ford, ¼ mile north of road junction.....	1,193
Telephone road, clump of five willow trees; wire nail in side of middle tree.....	1,186.74
Telephone road and Lee Lake road, forks; hub and tack 15 feet north of main road.....	1,177.1
Lee Lake Dam, west of; double willow tree north side of road, wire nail in crotch of.....	1,139.44
Sec. 7; tack in top of quarterpost west of road.....	1,142.7
Sec. 7, T. 5 S., R. 5 W., 3 feet east of quarter-section post center of, south of Temescal road; iron post, marked "1142".....	1,142.394
Adobe house, west of; wire nail in root of triple sycamore tree in grove, west side of road.....	1,022.31
Temescal, 1 mile south of post-office, at road forks; wire nail in root of sycamore tree (double) south of road.....	1,010.20
Temescal, opposite schoolhouse; hub and tack 1½ feet east of telegraph pole.....	1,107
Temescal, southwest corner of district school grounds; iron post marked "1114".....	1,113.682

TEMESCAL, VIA PORPHYRY, MAGNOLIA AVENUE AND SOUTHERN CALIFORNIA TRACK, TO ARLINGTON.

	Feet.
Temescal; nail in root of 12-inch oak tree, foot of hill, below schoolhouse.	1,096.48
Temescal, 1¼ miles north of schoolhouse; nail in root of eighth sycamore tree from south end of row at foot of grade	967.29
Temescal, 1¼ miles north of schoolhouse at forks of road; nail in root of sycamore tree	938.36
Blacksmith shop, ¼ mile east of; wire nail in southeast corner of box culvert	918.5
Blacksmith shop, ¼ mile north of; top of east end of stone pipe culvert	899.27
Rugby district school, opposite; hub and tack 5 feet west of telegraph pole	893.9
Rugby district school, northeast corner of grounds; iron post marked "897"	897.250
Hogue's Canyon road, north of; tack in southeast end of culvert sill	837.2
Rugby school, 1¼ miles north of, opposite eucalyptus grove; tack in top of 4 by 4 inch corner post to culvert	859.6
Porphyry quarry road; wire nail 1 foot above ground in brace to telegraph pole	901
Porphyry quarry and corona road, southeast corner of; iron post marked "903"	903.327
Porphyry works, south of road forks to works and to Arlington; hub and tack	742.9
Magnolia avenue, Temescal Creek bridge; wire nail in south end of west floor beam, 6 miles southwest of Arlington	645.27
Magnolia avenue, south roadway, 1 mile east of bridge; tack in north end of culvert	663.7
Magnolia avenue, north side, crossroad culvert; tack in northwest corner.	673.5
Magnolia avenue railroad crossing; hub and tack 5 feet southeast of "lookout" post	686
Magnolia avenue, 250 feet northeast of railway crossing in line with center row of trees; iron post marked "687"	687.018
Railway culvert; wire nail in northeast corner	695.5
Fillmore street crossing, 1¼ miles northeast of Magnolia avenue railway crossing; tie spike in root of eucalyptus tree	719.4
Trestle No. 25, west of Indiana avenue crossing; tack in north end of west bulkhead board	746.3
Arlington, ¼ mile southwest of; wire nail in 4 by 10 inch footing for lateral brace, north truss of canal bridge	805.5
Sage post-office, 1 mile north of, at top of grade; wire nail in southwest corner of box culvert	2,486.6
Sage Divide, 10 feet east of road, 260 paces south of top of Hemet grade; iron post marked "2615"	2,615.055
Creek crossing in canyon; wire nail in east corner of culvert at sharp turn in road	2,268.22
Foot of grade, in west fence line south of; wire nail in root of scrub oak clump	2,125.82
Sage Divide, 3½ miles north of; wire nail in root of oak tree 20 feet east of road, south of corner of fence on west side of road	1,870.30
Diamenta schoolhouse, 20 feet east of entrance in edge of lawn, ¼ mile west of county road; iron post marked "1626"	1,626.098
Road to schoolhouse, 2 feet west of gutter, west side of county road, between turnouts to cross road	1,641.6
Old well, 210 paces south of, 5 feet west of road; hub and tack	1,582.5
Hemet, 1.4 miles south of, at State and Stetson streets; tack in top of southeast block post marked "W. 216"	1,587.9

WHITEWATER TO PALM SPRINGS.

	Feet.
Point of hill, 2¼ miles southeast of trestle 584 F, 25 feet east of rocky point, 5 feet south of Rubble Canal from Whitewater River to Palm Springs; iron post marked "828"	828.021

PALM SPRINGS, VIA TRAIL, TO VANDEVENTERS.

Palm Springs, 1½ miles south of, at junction of Whitewater road; tack in 1 by 3 inch corner piece to flume at northwest corner of fenced yard	560
Palm Springs Hotel, in south concrete wall of building; bronze tablet marked "455"	455.133
Palm Springs post-office, cottonwood tree 30 feet east of; nail in root	449.10

ELSINORE JUNCTION, VIA SOUTHERN CALIFORNIA RAILWAY TRACK, TO TEMECULA.

Elsinore Junction; wire nail in middle of south side of car house platform, over sill	1,280.4
Trestle No. 14, southwest corner; wire nail in top of pile	1,267.1
Trestle No. 15; wire nail in west end of north bulkhead board	1,288.23
Wildomar, ¾ mile north of; hub and tack 8 feet north of rail east of road crossing	1,264.9
Wildomar, station platform; tack 2 inches north of telegraph pole	1,244.70
Wildomar, corner of Main street and Murrietta road, in angle of L-shaped schoolhouse grounds; iron post marked "1254"	1,253.993
Wildomar, 1.2 miles south of; hub and tack 2.4 feet north of post of cross fence south of track	1,198.9
Trestle No. 16, tack in south end of east floor beam	1,175.2
Murrietta, 1.6 miles north of; tack in top of 6 by 8 inch post northeast corner of railroad culvert	1,141.7
Murrietta, ¾ mile north of; 30 feet west of road crossing; hub and tack 3 feet southwest of trail	1,110.8
Murrietta depot, north corner of platform, wire nail in sill	1,089.62
Murrietta, in southwest corner of public school grounds; iron post marked "1092"	1,092.246
Trestle No. 18; wire nail in bulkhead board at southeast corner	1,071.17
Trestle No. 20; wire nail in bulkhead board at north corner	1,041.11
Linda Rosa, road crossing; top of rail	1,034.1
Trestle No. 21; southeast corner; wire nail in top of pile	1,029.4
Temecula, 1.5 miles north of; wire nail in cattle guard, 1.5 feet south of rail, square cut	1,018.26
Temecula; wire nail in 6 by 6 inch post at south corner of Trestle No. 22	1,002.26
Temecula, in brick foundation under center window of public school building; bronze tablet marked "1019"	1,018.951
Temecula; tack in top of fence post in south corner of public school grounds	1,015.8

TEMECULA TO WINCHESTER.

Gonzales house, south of, at forks of road; hub and tack 14 inches from telegraph pole	1,027.6
Temecula schoolhouse, 2¼ miles from, foot of hill; hub and tack 5 feet northeast of blazed fence post	1,062.8
Junction with Temecula cross country road; hub and tack in forks	1,075.1
Murrietta, Hot Springs road forks, near foot of grade; hub and tack in forks	1,101.5
Murrietta Hot Springs road; tack in northeast corner of bridge floor	1,162
Township line between T. 7 S., R. 2 W., and T. 7 S., R. 3 W., section 18, top of grade; iron post marked "1309"	1,308.866

	Feet.
Alamos schoolhouse, 1.5 miles west of; hub and tack 1 foot east of fence corner at crossroads	1,333.7
Alamos district school; hub and tack at northeast corner of building	1,374.5
Alamos district school grounds, 35 feet east of building; iron post marked "1375"	1,375.267
Alamos schoolhouse, ¼ mile north of; tack in top corner post of secs. 32, 33, 5 and 4, between T. 6 S., R. 2 W., and T. 7 S., R. 2 W	1,369.2
Bridge, wire nail in projecting 2 by 12 inch timber at northeast corner	1,412.79
Winchester, 6¼ miles south of, 335 feet north of bridge; iron post marked "1419"	1,418.756
Timber culture, northeast corner of; hub and tack 7 feet north of road in line with fence	1,458.1
Leon post-office road, 2 feet east of; hub and tack	1,504
Diamond Valley, northwest corner of culvert, wire nail in projecting timber, 2½ miles south of Winchester	1,455.72
Diamond Valley, 2½ miles south of Winchester, at southeast corner of fenced road to Hemet; iron post marked "1458"	1,457.674
Winchester, 2 miles south of; hub and tack 3 feet west of end post, east side of road	1,501.7
Summit, between Winchester Valley and Diamond Valley	1,525.6
Winchester; top of water pipe exposed at northeast corner of public school building	1,465.10

HEMET TO KENWORTHY POST-OFFICE.

Hemet, in brick column on north side of entrance of grammar-school building; bronze tablet marked "1591"	1,591.027
Florida avenue and San Jacinto street, northeast corner of; tack in top of lock stake	1,623.7
Dartmouth street; tack in top of 4 by 4 inch post, under lid of water-gate box	1,679.7
Inverted siphon, west of Wash; tack in top of north end of	1,725.1
Florida Hotel, bridge west of; wire nail in northwest corner of floor	1,759.5
Valle Vista school grounds, southwest corner of; iron post marked "1765"	1,765.017
Florida avenue, north side of east end; wire nail in root of eucalyptus tree	1,796.35
Morris House; wire nail in root of cottonwood tree on north side of road, near the hydrant	1,851.10
Camp grounds; wire nail in root of cottonwood tree on bank of canal, 3½ miles from Florida avenue	1,918.63
San Jacinto River truss bridge; tack at southeast corner	1,998.9
Township line, top of knoll 20 feet south of road and east of bridge; iron post marked "2062"	2,061.971
"North Branch" bridge; top of bolthead at southeast corner of truss	2,124.75
Old toll house; wire nail in root of oak tree south of road forks	2,234.92
Double truss, east of; tack in north side of flume at beginning of curve	2,412.8
Strawberry Creek bridge; wire nail in compression timber, east corner of	2,921.1
Strawberry Creek, 125 feet from east side of road, in granite bowlder; copper bolt marked "2932"	2,931.932
Canyon bridge, southeast corner of; wire nail in guard plank	3,098.7
Switch back, ¼ mile from bridge; hub and tack south of curve	3,321.9
Barrel spring, 1 mile west of; nail in root of pine tree on edge of canyon	3,538.89
Barrel spring; wire nail in root of sycamore tree	3,937.97
Wood road, by pile of rocks west of; hub and tack	4,281
Johnson Creek, strawberry road; wire nail in southeast corner of bridge	4,410.7

	Feet.
Johnson Creek, 170 feet north of bridge, east side of road, inside of angle in fence; iron post marked "4443"	4,443.002
Hemet Valley road, ¼ mile east of bridge; wire nail in root of pine tree 4 feet in diameter, south of road	4,502.81
Hancock Johnson ranch, opposite and west of gate; wire nail in root of pine tree south of road	4,742.55
Divide, Hemet Valley and San Jacinto drainage, 20 feet north of road; iron post marked "4936"	4,935.965
Divide, ¼ mile east of, 25 paces south of road; wire nail in root of oak tree	4,690.61
Hemet Reservoir, creek drainage to, 40 paces west of; wire nail in root of pine tree south edge of road	4,388.68
Creek ford	4,378
Thomas's ranch, opposite and north of house, west of road at fence corner on section line between section 3 and section 10; iron post marked "4394"	4,393.918
Thomas's ranch, gate south of; wire nail in root of east pine tree of a pair which stand in east side of road south of gate	4,404.28
Thomas's ranch house, 2¾ miles south of; wire nail in root of pine tree on east edge of road	4,461.17
Thomas's ranch, south gate, 10 feet east of, where road forks to Kenworthy and Cohuilla Valley; iron post marked "4509"	4,508.951
Kenworthy post-office, 1¼ miles west of Cohuilla road; wire nail in east root of pine tree east edge of road, ¾ mile south of Thomas's ranch gate.	4,575.25

KENWORTHY POST-OFFICE, VIA MISSION INDIAN RESERVATION, TO WILSON VALLEY.

Cohuilla Divide, 1¼ miles north of; wire nail in west root of east pine tree of a pair east of road	4,709.86
Cohuilla Divide, 18 feet west of road; iron post marked "4965"	4,965.188
Cohuilla Divide, ¼ mile south of; 14-inch iron bolt flush with ground and marked, east side of road	4,603.75
Hamilton House, south of road and west of path; wire nail in root of elder tree	4,161.22
Casner's ranch; hub and tack south of tenth fence post east of blazed corner	4,004.2
Old's adobe house, west of; hub and tack 2 feet east of division fence post.	3,913.7
Mission Indian Reservation, north gate, 20 feet west of, on north side of road; iron post marked "3836"	3,835.948
Indian school, 1¼ miles southwest of north gate of road to; hub and tack 2 feet east of blazed fence post, west side of road north of fence corner.	3,727.2
Indian school, 1 mile east of; hub and tack at first post west of fence corner, south side of road	3,602.2
Indian school, Cohuilla, 3 feet north of the southwest corner of the chapel yard; iron post marked "3635"	3,634.896
Cohuilla post-office, west of, at forks of road; hub and tack 5½ feet west of fence corner	3,534.0
Cohuilla Creek; circle chiseled on bowlder east side of road south of creek, 3 miles west of Indian schools	3,462.31
Mission Indian Reservation, west entrance to; hub and tack 2.3 feet northeast of corner fence post south of gate, south of J. Park's house	3,424.1
Divide between Cohuilla and Wilson valleys, 7 feet southeast of road; iron post marked "3542"	3,542.257
Divide, 1 mile southwest of; round hub and tack and rocks on north side of road	3,313.8
Thompson's corral, opposite and 75 paces east of road to; circle chiseled on bowlder, 20 feet long, 4 feet wide, and 2 feet high, north side of road.	3,183.63

	Feet.
Sulphur spring, top of lowest flat rock	3,155.7
Bergman and Sage road forks, 7 feet north of, top of conical bowlder 1 foot high	2,888.25
Wilson Valley, east of, at top of grade; hub and tack 3½ feet west of road.	2,639.5
Creek ford, east of Wilson Valley	2,170
Wilson Valley, 4 feet east of road at lowest point; iron post marked "2146"	2,146.066

WILSON VALLEY, VIA SAGE TO HEMET.

Wilson Valley, near foot of grade; hub and tack 4 feet north of Cohuilla road	2,243.5
Wilson Valley, west side of, top of grade; hub and tack by bank	2,473.6
Summit between Wilson Creek and Lewis Valley	2,619.5
Butterfield and Cohuilla road; hub and tack in forks at junction	2,563.2
Oak Grove road, at junction with Cohuilla road; circle chiseled on bowlder on south side of road	2,290.54
Lewis Valley; wire nail in root of elder tree at fence, corner of road to Lewis's house	2,092.25
Lewis Valley, east of road, 18 feet north of line fence between sections 20 and 29; iron post marked "2130"	2,130.16
Stevens's house, north of road to, at foot of grade, near lone cottonwood tree; tack in east end of culvert	2,236.1
Divide, between Lewis Valley and Sage, 5 feet west of road; hub and tack	2,510.3
Sage post-office, east of, on east side of Cohuilla road; iron post marked "2283"	2,283.079
Palm Springs, 1¼ miles south of hotel; wire nail in northeast corner of small bridge over canal	438.34
Garden of Eden; on township line between T. 4 S., R. 4 E., and T. 5 S., R. 4 E., east of Palm Canyon road; iron post marked "557"	557.058
Creek ford, north of, at fence corner; hub and tack	667.6
Creek ford, 1 mile south of, east of trail; hub and tack and pile of stones	930.8
Palm Canyon, west side, in a grove of palms on southwest side of main canyon at side of trail; iron post marked "1000"	999.980
Palm Canyon; trail crossing	978
Palm Canyon, 1½ miles south of, 12 feet west of trail, by an ironwood bush; hub and tack and rock pile	1,495.4
Mesa, west of two rocky points between which trail runs, 40 feet north of rock outcrop and 4 feet south of trail; hub and tack	1,841.9
Cottonwood grove by creek, southeast of, on trail near gate in old fence line, 4 miles south of Palm Canyon trail crossing; hub and tack and stone pile	2,054.2
On spur between drainages, 8 feet west of trail; hub and tack	2,490
Top of grade, north of valley 2 miles long; circle chiseled on white rock 2 feet in diameter, 8 feet east of trail, where trail descends into valley	2,918.03
Mining camp in valley between trail and creek; wire nail in crotch of double willow tree opposite	2,874.72
Valley, south end of, near rocky gorge; by the west wall of canyon, 100 feet southwest of creek crossing, where trail leaves the main canyon and takes over some hills to the east; iron post marked "3000"	2,999.272
Little Valley, south end of; 5½ miles north of Vandeventers; wire nail in root of willow tree between trail and creek	3,162.30
Circle chiseled on bowlder at south side of piñon tree, 40 feet high, east of trail, west of creek and of high rocky promontory on east bank	3,331.70

	Feet.
Hog Back, south end of, south of the bare rocky point; hub, tack, and stone pile east side of trail	3,740.7
Vandeventers, 1¼ miles north of; round hub and nail 8 feet west of lone piñon tree, 20 feet high, on brush-covered mesa between trail and tree	4,342.6
Vandeventers, just south of; 50 feet south of summit, where trail descends from brush-covered mesa into canyon; hub and tack 5 feet east of trail	4,418.6

VANDEVENTERS TO KENWORTHY POST-OFFICE.

Vandeventers, north of house on a little knoll, in a granite bowlder 3 feet high, 8 by 4 feet, 50 feet east of road to house just south of where it forks to Kenworthy; copper bolt marked "4549"	4,548.866
Vandeventers, ¼ mile west of; wire nail in root of live oak tree 7 feet south of road	4,633.1
Divide, ¼ mile east of; round hub and tack and marker 2 feet south of road	4,814.3
Divide, between Vandeventers and Kenworthy; 2 by 4 inch hub and tack 25 feet west of top of grade, 2 feet south of road	4,972.3
Kenworthy, 2½ miles southeast of; hub and tack 5 feet south of road and 300 feet south of lone pine tree on side hill	4,778.1
Kenworthy, 1 mile southeast of; pine tree 4½ feet in diameter 40 feet south of road	4,635.66
Kenworthy, south of post-office, in a granite bowlder 3 feet high, 7 by 5 feet, at rocky point 100 feet north of Wash by the trail; copper bolt marked "4566"	4,565.691

BANNING INDIAN RESERVATION.

Corner common to T. 2 S., R. 1 E., and T. 3 S., R. 2 E., and San Bernardino Forest Reserve, 1½ miles north of Southern Pacific Railroad, in top of square iron post filled with concrete; copper bolt marked "2342"	2,341.648

STUBBY CANYON.

Corner common to T. 2 S., R. 2 E., and T. 3 S., R. 3 E., and San Bernardino Forest Reserve, 2 feet north of; 1.7 miles north of Southern Pacific Railroad; iron post marked "1978"	1,977.977

NEVADA-CALIFORNIA.

ESMERALDA AND MONO COUNTIES.

SILVER PEAK QUADRANGLE.

The elevations in the following list are based on that of a bronze tablet set in the brickwork of front of post-office building in the town of Candelaria, which is marked "5741 feet, C. C. datum." The initial elevation for this work was taken from subgrade, i. e., bottom of crosstie in roadbed of Carson and Colorado Railroad in front of doorway of station at Candelaria. This elevation was assumed at 5,970 feet above sea level, as given by the railroad authorities.

The leveling was done by Mr. C. R. Smith, levelman, under the general direction of Mr. W. T. Griswold, topographer.

CANDELARIA, VIA STAGE ROAD, TO COLUMBUS.

	Feet.
Candelaria post-office, in brickwork of front of; bronze tablet marked "5741"	5,741.368
Candelaria, 2 miles south of; at Sodaville crossroads, on top of iron post of guideboard	5,395.80

	Feet.
Candelaria, 5¾ miles south of; in quartz outcropping on right side of road at summit; bronze tablet marked "5394"	5,394.049
Candelaria, 7 miles south of; at summit of road in second gap, on head of large bottle set in earth on right-hand side of road	5,127.5
Candelaria, 7½ miles south of; at summit of road in third gap, on head of bottle planted on right side of road	5,121.5
Columbus, 2 feet west of southwest corner of E. Moleno's saloon; iron post marked "4625"	4,625

COLUMBUS, VIA STAGE ROAD, TO SILVER PEAK.

Columbus, 2 miles south of; on head of bottle planted in the marsh on right side of road	4,586.9
Columbus, 8½ miles south of; on left side of road, at point where road to Lone Mountain branches off; iron post marked "4671"	4,670.612
Columbus, 9½ miles south of; at point of departure of road leading to coal mines, on red granite embedded rock	4,762.83
Columbus, 10¾ miles south of; on big white granite bowlder marked "B.M.+," about 40 feet left of road at a point about 600 feet beyond the entrance of road into gulch	4,919.42
Columbus, 12 miles south of; on flat rock marked "B.M.+" at forks of road which branches to right	5,017.02
Columbus, 13½ miles south of; 20 feet right of road on summit in sandstone outcropping; bronze tablet marked "5208"	5,208.065
Columbus, 15½ miles south of; on top of iron post of Saltwell guideboard	5,010.09
Columbus, 16½ miles south of; on top of iron post of Fishlake guideboard	5,036.27
Columbus, 17 miles south of; on embedded gray stone marked "+," 10 feet left of road, surrounded by a ring of rocks	5,036.13
Columbus, 18 miles south of; on embedded black rock marked "+," 6 feet left of road; ring of rocks roundabout	4,948.21
Columbus, 19 miles south of; on top of iron pipe of Drywell guideboard	4,913.68
Columbus, 21¾ miles south of; where road crosses over second summit, on embedded brown stone marked "+," 20 feet to right of road; ring of rocks roundabout	5,060.18
Columbus, 23 miles south of; on round white bowlder marked "+," 6 feet left of road to	5,013.191
Columbus, 25½ miles south of; set at junction with Reese River; iron post marked "4996"	4,995.769
Columbus, 26½ miles south of; at point where long low ridge of black lava comes down from the west, on embedded white granite rock marked "+," surrounded with ring of rocks and 20 feet to right of road	4,908.20
Columbus, 27½ miles south of; on top of iron pipe of Montezuma guideboard	4,848.73
Columbus, 28½ miles south of; at summit of road on small embedded rock 12 feet to right of road, marked by ring of rocks	4,851.09
Columbus, 29½ miles south of; on brown rock 2 feet to left of road, at a point 100 feet north of where wood road comes in from the west	4,750.82
Columbus, 30½ miles south of; on big black rock marked +, 50 feet right of road at a point opposite a 10-foot cutting in base of cinder cone	4,638.81
Silver Peak; on doorsill of post-office	4,361.14
Silver Peak, in west end of; in stone front of Chialdavitch store; bronze tablet marked "4382"	4,382.307
Silver Peak Lake, average elevation of surface of	4,349

SILVER PEAK, VIA ALIDA VALLEY ROAD, TO BARREL SPRINGS.

Silver Peak, ¼ mile south of; on top of iron post of Palmetto guideboard	4,372.35
Silver Peak, 5½ miles south of; on small embedded rock surrounded by a ring of stones, 6 feet to left of road at foot of grade	4,367.73

	Feet.
Silver Peak, 7 miles south of; on embedded black rock marked by ring of black rocks roundabout, 6 feet to right of road on edge of first bench ..	4,502.90
Silver Peak, 9½ miles south of; at junction of road from Indian Gardens; iron post marked "4803"	4,802.891
Silver Peak, 11 miles south of; on top of Indian rock mound monument standing about ¼ mile to east of road	5,016.69
Silver Peak, 12½ miles south of; on embedded black stone marked by surrounding ring of rocks, 8 feet to right of road at a point 300 yards beyond where a branch road turns to right into gulch	5,295.99
Silver Peak, 14 miles south of; on embedded stone marked by surrounding ring of stones, on right side of road at a point about 300 feet before reaching the top of a made side-hill grade descending into gulch up which road continues	5,603.45
Silver Peak, 14½ miles southeast of; on round black bowlder 30 feet to left of road in gulch and about 20 feet beyond large white outcropping of rock opposite the face of a cliff of same white stones	5,662.41
Silver Peak, 15½ miles southeast of; on big gray bowlder on left side of road opposite mouth of second left-hand side gulch containing timber and about 1 mile below Barrel Springs	5,912.13
Barrel Springs; at right of mouth of tunnel; iron post marked "6177"	6,177.372

SILVER PEAK TO FISH LAKE VALLEY, VIA SUMMIT ROAD.

Silver Peak, 1 mile northwest of; on low white quartz outcropping marked by surrounding ring of stones on first knoll to left of road	4,581.11
Silver Peak, 1¾ miles northwest of; on gray granite pyramidal bowlder standing edgewise, with cross chiseled thereon, 8 feet to left of road	4,860.74
Silver Peak, 2½ miles northwest of; on black rock 20 feet to right of road, defined by surrounding ring of rocks	5,080.05
Silver Peak, 3¼ miles northwest of; on flat gray granite bowlder on left side, defined by chiseled cross, where road turns to right into wash of first canyon	5,348.22
Coyote Spring; iron post marked "6041"	6,041.350
Silver Peak, 6¼ miles northwest of; on top of iron post of Silver Peak Mine guideboard	6,709.39
Silver Peak, 6½ miles northwest of; on point of outcropping of rock marked with chiseled cross, on right side of road in middle of bend at head of steep grade called "Cedar Pitch"	6,968.07
Silver Peak, 7 miles northwest of; on summit 50 feet to left of road; iron post marked "7353"	7,352.993
Silver Peak, 7¼ miles northwest of; notch cut in wooden post of Silver Peak guideboard, marked "7256" on post	7,256.32
Silver Peak, 8¼ miles northwest of; on embedded stone 10 feet to left of point where road cuts through a low sandstone ridge, defined by a ring of rocks roundabout	7,027.35
Silver Peak, 9¼ miles from; on embedded stone 5 feet to right, defined by surrounding ring of rocks where road passes over a low lateral ridge nearly on a level	6,858.77
Silver Peak, 10¼ miles from; on top of huge brown bowlder marked by chiseled cross, which stands at left side of road at foot of first cliff passed	6,676.35
Coyote Hole; on curbing of well, marked by a cross and the figures "6558" cut in woodwork	6,557.96
Cave Springs; on outcropping of red rock in edge of side hill directly opposite water pool	6,241.13
Cave Springs; in front of right wall of cave; bronze tablet marked "6248"	6,247.549
Silver Peak, 13¼ miles from; on large yellow bowlder on west side of road, opposite lower end of a 40-foot cutting, bank of gray sand, marked by chiseled cross cut thereon	6,074.70

	Feet.
Silver Peak, 15½ miles from; on huge yellow sand-rock bowlder, cross chiseled thereon, 10 feet left of road, opposite last rocky cliff passed	5,665.96
Silver Peak, 16½ miles from; on huge, long, red bowlder on left side of road, cross chiseled thereon	5,470.78
Silver Peak, 18 miles from; on white bowlder 30 feet left of road, cross chiseled thereon	5,212.65
Silver Peak, 19 miles from; on broad flat bowlder in wash on left side of road, cross chiseled thereon	5,039.21
Silver Peak, 20 miles from; where road turns south toward Fishlake; on black rock defined by surrounding ring of rocks 40 feet to right of road.	4,858.87
Silver Peak, 25 miles from; at junction with Fishlake Valley road; on top of iron post of guideboard	4,813.01
"The Crossing," on Mineral Monument Hill; iron post stamped "4825"..	4,825.347
"The Crossing," 1 mile northeast of; floor of Pacific Borax Works building, on south edge of wash	4,781
"The Crossing," 5½ miles northeast of; at a point about 200 feet below entrance of road into canyon; on a big red bowlder 20 feet to left of road marked by cross	5,250.92
Bender's Pass; iron post marked "6145"	6,144.316
"The Crossing," 8¾ miles from; on embedded stone defined by ring of rocks roundabout, 3 feet to right of road at top of steep grade	5,820.51
"The Crossing," 10 miles from; on embedded stone surrounded with ring of rocks, 20 feet to left of road at foot of steep grade.	5,301.49
"The Crossing," 13 miles from; on top of iron post of guideboard at junction with Columbus road, which is marked "Fishlake Valley 13 miles".	5,036.27

SILVER PEAK, VIA PIPER ROAD TO OASIS.

Silver Peak, ½ mile south of; on top of Palmetto guideboard	4,372.35
Silver Peak, 2½ miles west of; on lone black bowlder 2 feet to left of road near point of low dark ridge close to road on the left	4,423.90
Silver Peak, 3¾ miles west of; on small embedded blue rock marked by surrounding ring of rocks on right side of road	4,405.22
Silver Peak, 6 miles west of, near Oasis guideboard; iron post marked "4450"	4,450.166
Silver Peak, 10 miles southwest of; on embedded bowlder marked by surrounding ring of rocks 4 feet to left of road	4,699.12
Silver Peak, 11 miles southwest of; on flat yellow sandstone bowlder 15 feet to left of road, marked by surrounding ring of rocks	4,900.09
Silver Peak, 12½ miles southwest of; on conical brown bowlder 6 feet right of road	5,298.89
Silver Peak, 14 miles southwest of; on slate bowlder 4 feet to left of road at junction of crossroads from Cowcamp	5,839.40
Silver Peak, 15 miles southwest of; on striped limestone bowlder 4 feet to left of road near group of three pine trees in inner angle of zigzag at foot of rocky cliff of blue limestone	6,403.24
Silver Peak, 16½ miles southwest of, 10 feet to left of road on summit; iron post marked "6961"	6,961.246
Silver Peak, 24 miles southwest of, on north side of road near triangulation station of State line survey; iron post marked "5121"	5,121.423
Oasis post-office, in face of stone building on the Piper ranch; bronze tablet marked "5106"	5,106.061

COLUMBUS, VIA FISHLAKE VALLEY STAGE ROAD, TO OASIS.

Columbus, 9 miles south of, at junction of Calmville Borax Works road, on black rock surrounded by ring of stones	4,721.68
Columbus, 10 miles south of, 100 feet south from the spring at the gap; iron post marked "4744"	4,743.910

	Feet.
Columbus, 10¼ miles south of, on big round brown bowlder standing 20 feet to left of road, marked with chiseled cross	4,753.06
Columbus, 12¼ miles south of, on broad low turtle-back shaped bowlder on left side of road, marked with chiseled cross	4,819.94
Columbus, 14 miles south of, on yellow conical rock outcropping 20 feet to left of road at point where a long, low yellow ridge runs down northeastwardly toward the marsh, marked with chiseled cross	4,987.94
Columbus, 15 miles south of, on small brown embedded rock marked by ring of stones roundabout, 10 feet to left of road on top of highest ridge crossed by road	5,017.36
Columbus, 18 miles south of; on floor of second small bridge over stream at "The Crossing"	4,777.31
Mineral Monument Hill near "The Crossing;" iron post marked "4825"	4,825.347
Chiatiavitch crossroads, on top of 4 by 4 inch by 4 foot post of mail box	4,804.51
Fishlake salt marsh, surface of, where crossed by road	4,791
Silver Peak road junction; on top of iron post of guideboard	4,813.013
Dyer post-office; cross cut in back of horse drinking trough at spring marked "4835"	4,834.65
Smith ranch buildings, on top of mail box in front of	4,870.45
Stuart home, opposite, between road and shore of Fish Lake; iron post marked "4865"	4,865.549
Columbus, 33 miles south of; on top of corner post of fence of first field on east side of road	4,893.49
A. G. McAfee's ranch; on stone foundation to adobe builing used as men's sleeping quarter's	4,918.96
Columbus, 4½ miles south of; on top of large stone monument piled up on right side of road at summit	5,087
Triangulation station of State line survey, 60 feet north of road; iron post marked "5070"	5,070.137

MISCELLANEOUS ELEVATIONS AT ISOLATED POINTS.

Calmville Borax Works; on 40-penny nail driven in northwest corner of office building	4,510.93
Salt well; iron post marked "4869"	4,869.958
Sulphur mine on Reese River road, about 2 miles north from its junction with Silver Peak road, on floor of old cabin, marked by a cross of eight brass-headed tacks	5,112.24
Reese River road, 7¼ miles north from its junction with Silver Peak road; iron post marked "4841"	4,841.991
Northwest corner T. 1 S., R. 38 E.; iron post marked "5606"	5,606.055
Northwest corner of T. 1 S., R. 40 E.; iron post marked "5453"	5,452.634
Corner of secs. 8, 9, 16, and 17, T. 2 S., R. 40 E.; iron post marked "4346"	4,346.467
Northwest corner of T. 4 S., R. 39 E.; iron post marked "4661"	4,661.053
South corner common to secs. 31 and 32, T. 3 S., R. 38 E.; iron post marked "5979"	5,978.625
Cowcamp, on top of side board at upper end of water trough	5,133.2
Cowcamp, at summit of cross roads 1¼ miles beyond, on big black bowlder standing alone 4 feet to left of road	5,782.75
First summit of mine road running from main road between Fish Lake and Silver Peak southeasterly to the Drinkwater mines, on butt of sawed-off limb of lone big dead tree on left of road defined by a cross	7,626.5
Second summit of above road, on brass cap driven in top of pine stump 20 feet to left of road at center of swingway of said road	7,665.87
Blair mine, on summit of trail running from Valcadis's building to; iron post marked "7298"	7,297.617

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[Nineteenth Annual Report.]

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Mineral Resources of the United States, 1887, by David T. Day. 1888. 8°. vii, 832 pp. Price 50 cents.

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Mineral Resources of the United States, 1893, by David T. Day. 1894. 8°. viii, 810 pp. Price 50 cents.

On March 2, 1895, the following provision was included in an act of Congress:

"*Provided*, That hereafter the report of the mineral resources of the United States shall be issued as a part of the report of the Director of the Geological Survey."

In compliance with this legislation the following reports have been published:

Mineral Resources of the United States, 1894, David T. Day, Chief of Division. 1895. 8°. xv, 646 pp., 23 pl.; xix, 735 pp., 6 pl. Being Parts III and IV of the Sixteenth Annual Report.

Mineral Resources of the United States, 1895, David T. Day, Chief of Division. 1896. 8°. xxiii, 542 pp., 8 pl. and maps; iii, 543–1058 pp., 9–13 pl. Being Part III (in 2 vols.) of the Seventeenth Annual Report.

Mineral Resources of the United States, 1896, David T. Day, Chief of Division. 1897. 8°. xii, 642 pp., 1 pl.; 643–1400 pp. Being Part V (in 2 vols.) of the Eighteenth Annual Report.

Mineral Resources of the United States, 1897, David T. Day, Chief of Division. 1898. 8°. Being Part VI (in 2 vols.) of the Nineteenth Annual Report.

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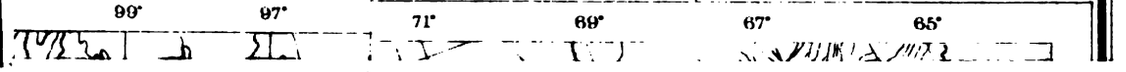
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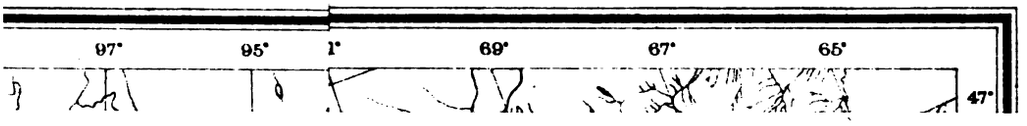
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